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EDITORIAL

COMMEMORATING ANDREAS VESALIUS

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In the midst of one of the most devastating wars that kills soldiers and civilians alike and wipes out entire populations, it is encouraging to hear of the great achievements of military medicine. Every day medical journals and the press report of new life-saving treatments, and there is no doubt that the knowledge and skill of our physicians and surgeons are able to preserve an endless number of human lives that would have been lost only a few decades ago.

We are justly gratified by the great advance of medical science, by the progress achieved during the last fifty years, but at the same time we are aware that this is but the culminating point in a long development. Great achievements were possible because centuries of research preceded our time. And when we feel inclined to rejoice, we cannot but remember our ancestors, the men who did the pioneering work against tremendous odds. Our mind wanders to the Renaissance, to the day when Andreas Vesalius, a young man of twenty-eight years, published his immortal work, Seven Books on the Structure of the Human Body—*De humani corporis fabrica libri septem.*

The *Fabrica* represents one aspect of the discovery of the world that took place during the Renaissance. It is one expression of the trend toward realism characteristic of the period. People began to be tired of speculation and wanted to see things with their own eyes. But the book was more: it marked a turning point in the history of medicine, or rather, it was the starting point of a new medical science. During the Middle Ages eastern and western medicine had developed on the same foundations along similar lines, but only the West had the experience of the Renaissance and made anatomy the basis of a new medicine, while the East followed traditional lines to our day.

Upon the foundation of human anatomy a new anatomical physiology was built during the 17th century, a new anatomical pathology during the 18th century. The symptoms of disease appeared as the *functio laesa* of anatomically changed organs. Clinical medicine was given a new and infinitely productive method of research. Observing the clinical course of diseases and writing case histories, performing autopsies on deceased patients and writing autopsy reports, the physicians of the 19th century by comparing the two documents were able to establish well defined disease entities that were not determined by their symptomatology alone but by the underlying anatomical lesion.

On the basis of this new approach the medical specialties developed. Instruments were devised that made the anatomy of the organs accessible to the physician's eye. And modern surgery was nothing else but the triumph of anatomical therapy.

Once the anatomical cycle was closed, medical science logically developed a functional, physiological approach, one however that remains based on anatomy. The development of chemistry and the discovery of pathogenic microorganisms opened up new horizons, and all these combined factors contributed to the formation of our present medical science.

On the threshold of these developments stands Andreas Vesalius, and today, four hundred years after the publication of his great book, we remember him in gratitude and pay tribute to his memory.

Vesalius belongs to many countries. His family came from Wesel in Lower Germany, moved later to Nymwegen in the Netherlands.

He was born in Brussels, then the capital of the Netherlands, today the capital of Belgium. He studied medicine in France, was a professor in Italy, printed his book in Switzerland, was physician to the imperial court in Spain and died on a Greek island. Every country has a claim to him and he thus symbolizes the unity of Western civilization.

Vesalius was born in the night of New Year's Eve 1514 to 1515. In 1914 the world was preparing to celebrate the four hundredth anniversary of his birth, but when the day came the lights had gone out and the world was plunged in war. Brussels, his birthplace, was invaded by foreign troops. Louvain, his alma mater, was sacked. It is a grim irony that today when we are celebrating the four hundredth anniversary of the publication of his great book, the world is at war again, destroying with improved weapons, with increased ferocity its common heritage.

Shall we sit down and despair? No, emphatically no. Just because we are living at such a trying moment of history and because we suffer from the destruction of timeless values, we must stand up and react against this savagery. Now if ever we must remember our past, the obligations it puts upon us. What are we fighting for, after all? Not for sources of raw materials, not for markets. We are fighting against a philosophy that is the negation of culture; fighting for freedom, for the liberation of the people of the world from the bonds of ignorance, poverty and disease; fighting to create the material conditions for culture, for the day when culture will not be the privilege of a small upper class but will be shared and carried and produced by the masses. In these dark days we must carry the torch.

There are people in this country who loudly assert that such celebrations should not be held in times of war, that they distract the attention from the major objective, the winning of victory, that all efforts should be directed toward the pursuit of the war. And yet these very people who are so eager to forget the past, to ignore the debt we owe to our ancestors, to abandon all cultural activities, often have enough time to play bridge and engage in other " non-essential " activities. They document by their attitude that culture to them is not a necessity like air and water, but merely a superficial ornament,

good for normal times but one that may be discarded lightheartedly in a period of emergency, that is, when we need it most desperately.

I really fail to see why we should not come together on solemn occasions to commemorate an event of the past, to acknowledge a debt, to renew our faith in science, in mankind, in the ideals of our predecessors that are still our ideals today. What good will it do us to win a military victory if we are starved culturally, if our imagination and enthusiasm have been so stifled, that we no longer have the courage to stand up and build the world of tomorrow? The few hours that such a ceremony may cost will not affect the war effort, and we can make up for them easily by concentrating in our work. The few dollars that such a ceremony may cost will not affect the war economy. They would not be invested in war stamps—they are not enough for bonds anyway—because they are contributed by people who have no surplus incomes. On the contrary, their incomes are greatly reduced, but they would gladly contribute a few dollars for the inspiration they would derive from such an event.

Many universities have dropped their commencement exercises "for the duration." We older professors who have attended many such exercises in the past, probably agree that commencement was some kind of an ordeal—in peace-time. Today when we are engaged in a life and death struggle, when the future of mankind is at stake, commencement has assumed more significance than ever. Our graduating students are in uniform, ready to go to the battlefields, ready to bring the supreme sacrifice to their country. Their immediate future is not a question of material success or failure but a question of life or death. We, their teachers, after having lived and worked with them for a number of years, feel at such a crucial moment the urge to commune with them, to clasp their hand, and to tell them what we have so deeply at heart, to tell them that there has been created a bond between us that only death can break, that they may regard the university as their second home to which they may always return and which will welcome them at any time. Words that come from the heart, spoken at a moment when our young people are so receptive, will vibrate in them. They will recall them in the anguished moments preceding their first battle, in dark nights spent on patrol duty or watching the sea from the bridge.

They will feel that they are not alone, that in addition to being members of a physical family they are members of a great institution that has its roots in the Middle Ages and leads into a bright future. Instead of dropping commencement exercises "for the duration", universities should have availed themselves of this unique opportunity, should have developed a new ritual, and from a stereotyped dull performance should have made commencement the most stirring and inspiring event in the student's life—now if ever.

It speaks for our country that the publication of a great medical book, in the small city of Basle, four hundred years ago, was deemed important enough to call for nation-wide celebrations in the midst of a world war.

The New York Academy of Medicine inaugurated the series of exercises when its Section of Historical and Cultural Medicine held a Vesalius meeting on January 13. The Cleveland Branch of the Army Medical Library arranged a remarkable Vesalius Exhibit at and in cooperation with the Cleveland Medical Library. The Regional Meeting of Medical Librarians held in Philadelphia on June 10 and 11 devoted a whole session to the commemoration of Vesalius. Festive Vesalius meetings were held by the Academy of Medicine of Rochester, in Rochester, N. Y., on June 16, by the California Academy of Sciences in San Francisco on October 6, by the Washington Academy of Sciences on November 18. Vesalius was commemorated by the William Welch Society of New York University College of Medicine, by the University of West Virginia School of Medicine and by a number of other universities including the Ecole Libre des Hautes Etudes, the French University in exile, where George Sarton was the speaker.

On October 30 the Historical Library of Yale University School of Medicine held a formal academic exercise with an outstanding symposium on Vesalius and an exhibit that displayed some of the riches of the Cushing Collection. On November 1st the Johns Hopkins Medical History Club began the 54th year of its activities with a Vesalius celebration for which occasion the Institute of the History of Medicine had prepared an exhibit illustrating the life and work of the great anatomist.

The *Bulletin of the Medical Library Association* devoted its entire

July number to Vesalius. The *Yale Journal of Biology and Medicine* will publish the papers read at the Yale Symposium. The most valuable publication of the year, however, was Harvey Cushing's posthumous *Bio-Bibliography of Andreas Vesalius* which with Moritz Roth's biography and M. H. Spielmann's iconography will constitute the iron foundation for all research on Vesalius.

The *Bulletin of the History of Medicine*, desirous of contributing its share, is devoting its December number to Vesalius. It contains the papers read before the Johns Hopkins Medical History Club, two papers presented at the Research Conference of the Institute of the History of Medicine on November 2 and a number of other papers pertaining to the subject.

Let us hope that the four-hundredth anniversary of the death of Vesalius will be celebrated in 1964 in a pacified, rejuvenated and joyful world.

ANDREAS VESALIUS, THE HUMANIST

LUDWIG EDELSTEIN

Vesalius' relation to the humanism of his time has been given scant attention by modern historians. Of course, it is generally recognized that the great scientist was a classicist by education; that he knew Greek and Latin to perfection; that he zealously studied the ancient authors and extolled them to the skies. In this sense it is a commonplace to speak of Vesalius as a humanist. Does not even the Oxford Dictionary say that a humanist is " one of the scholars who at the Revival of Learning in the fourteenth, fifteenth, and sixteenth centuries, devoted themselves to the study of the language, literature, and antiquities of Rome, and afterwards of Greece? " [1] But with all due respect to the authority of the Oxford Dictionary and of those who agree with its definition of the term " humanist "—it is no longer possible to maintain that the knowledge of Greek and Latin and the study of old books suffice to make a humanist. During the past few years it has become more and more evident that the humanists, beyond their predilection for antiquity, upheld other ideals which were peculiarly their own; that they adhered to certain aesthetic, historical and philosophical views which were distinctly different from those accepted by most of their contemporaries.[2] Vesalius, therefore, can justly be called a humanist only if, in addition to his formal training in the classics, he also shared those general principles which underlay the humanist movement.

Now, no direct testimony survives that might decide whether or

[1] Cf. *A New English Dictionary*, ed. by J. A. H. Murray, V, 1, 1901, *s.v.* Humanist, 3. Literary Hist. For Vesalius' classical studies, cf. M. Roth, *Andreas Vesalius Bruxellensis*, 1892, esp. pp. 61 ff., and in general also Wm. H. Welch, The Times of Vesalius, *The Johns Hopkins Hospital Bulletin*, XXVI, 1915, pp. 118 ff.

[2] Concerning the new interpretation of the humanist movement, cf. especially K. Burdach, *Reformation, Renaissance, Humanismus*, 1926[2]; E. Cassirer, Individuum und Kosmos in der Philosophie der Renaissance, *Studien der Bibliothek Warburg*, X, 1927. Cf. also the note of P. O. Kristeller, The Place of Classical Humanism in Renaissance Thought, *Journal of the History of Ideas*, IV, 1943, pp. 59 ff.

not Vesalius approved of the humanist dogma. Yet, in my opinion, one can conclude from his main work, the *De Fabrica*, what was his attitude towards humanism. Evidence to this effect is afforded even by the peculiar language in which the book is written. When I say "peculiar language," naturally I do not mean the fact that the *De Fabrica* is composed in Latin. Hardly any scientist of the sixteenth century would have presented his findings in the vernacular. But Vesalius renounced the Latin that was spoken and written by scholars of his time; he purified the common stock of words; he abandoned the simple colloquial prose style, the logical sequence of thought characteristic of the scientific literature of that period. Instead, Vesalius reintroduced the terminology of a time long past; he adopted a stately and rhythmical style, a rhetorical word order, in short, he imitated the periodic Latin, the "artistic prose" of Cicero, and he was the first anatomist to do so.[3] That this innovation was motivated by any arbitrary preference or by mere whim I cannot believe. I rather think that Vesalius wrote like Cicero because he wanted to write like a humanist. A few years previous to the time in which the manuscript of the *De Fabrica* was prepared, a bitter fight had raged in the humanist camp. The issue was whether Cicero was the only true model of correct Latin, or whether it was permissible to write a Latinity of one's own which integrated the changes brought about by the varying tastes and needs of the centuries.[4] Scaliger, the great philologist, had been the leader of the archaists; Erasmus, the profound scholar, had been the spokesman of the neoterics. The outcome of the struggle was that Scaliger

[3] This has been recognized by L. Olschki, *Geschichte der neusprachlichen wissenschaftlichen Literatur*, II, 1922, pp. 81 ff.; 98 ff. I differ with Olschki only in so far as I classify Vesalius' style not simply as "Kunstprosa," cf. *op cit.*, p. 98, of which there are many kinds, but more definitely as Ciceronian "Kunstprosa" which it undoubtedly must be in Olschki's opinion, too; cf. his analysis, *op. cit.*, p. 99. Incidentally, Celsus, whose work *De Medicina*, for Vesalius as well as for other Renaissance authors, was the most important source of their new medical terminology (cf. C. Singer, *The Evolution of Anatomy*, 1925, pp. 104, 117), was the only ancient author to apply the rules of Ciceronian "Kunstprosa" to the composition of medical writings; cf. J. Ilberg, A. Cornelius Celsus und die Medizin in Rom, *Neue Jahrbücher für das Klassische Altertum*, X, 1907, p. 378; pp. 387 f. Cf. below, n. 6.

[4] For details of this debate, cf. E. Norden, *Die antike Kunstprosa vom VI. Jahrhundert v. Chr. bis in die Zeit der Renaissance*, II[4], 1923, pp. 773 ff.

won, while Erasmus was defeated. Learning vanquished erudition; the Ciceronians, as they were called, gradually gained ascendancy. Henceforth, a humanist who set store by himself, in style and vocabulary never deviated from Cicero. But scientists, for decades, continued to write the Latin that they thought fit.[5] Vesalius, then, by subscribing to the Ciceronian ideal clearly ranged himself with the humanists. In every sentence which he composed, in every word which he chose, he attested his dependence on their newly established aesthetic theory.[6]

[5] Concerning Erasmus and Scaliger as the protagonists in this fight, cf. J. Burckhardt, *Die Kultur der Renaissance in Italien*, ed. W. Goetz, 1925[14], p. 232; J. Huizinga, *Erasmus*, 1928, pp. 180 ff.; p. 183. Norden's remark, *op. cit.*, p. 778, that the discussion between Ciceronians and anti-Ciceronians lasted until the second third of the seventeenth century does not imply that for the majority of the humanists the issue had not been decided long before that time, cf. F. Skutsch, Die Lateinische Sprache, *Die Kultur der Gegenwart*, I, 8, 1905, p. 446. The anti-Ciceronian position taken by such men as Lipsius (cf. Norden, *op. cit.*, p. 775) was exceptional. For the style of later anatomists, cf. Olschki, *op. cit.*, II, p. 101. Vesalius' humanist tendencies taken into account, it does not seem fortuitous that he twice attacks Erasmus because of his having used a faulty Latin term, *De Fabrica*, I, 31, p. 140, l. 19; I, 23, p. 107, l. 18; Roth, *op. cit.*, p. 149; Vesalius rarely quotes writers of his time, especially non-medical authors; cf. L. Thorndike, *A History of Magic and Experimental Science*, V, 1941, pp. 523 ff. Another echo of Vesalius' stand regarding the question of proper Latinity I find in Scaliger's high praise of Vesalius, cf. *Prima Scaligerana*, 1670, p. 99; Roth, *op. cit.*, p. 301, n. 8.

[6] Olschki, the first to see the problem presented by Vesalius' Latin, suggests, *op. cit.*, p. 99, that the style of the *De Fabrica* was developed from that of Vesalius' lectures. But even if this were so, the question would still remain why Vesalius spoke and wrote Ciceronian Latin. Vesalius' achievement in introducing a new scientific language, for which he had a model in Celsus' work alone, cf. above, n. 4, is great indeed. When he speaks of his own style as *ieiuna et parum exercitata*, *De Fabrica*, praefatio, p. 4v, ll. 9-10, cf. also Roth, *op. cit.*, p. 180, n. 2, one can interpret this statement only as an expression of modesty in a young author (cf. *ibid.*, p. 4r, l. 43: *iuvenile hoc meum studium*), whether it be genuine or demanded by literary cant. It should be noted that even in his early writings Vesalius showed a keen interest in stylistic matters. In his edition of Rhazes, which appeared in 1537, he condemned the Arabic style as coarse, and showed a fine appreciation of the classical style, its beauty, harmony, elegance and conciseness; the *Letter on Bloodletting*, 1539, is a masterpiece, embodying all those qualities which Vesalius admired in the ancients; the same seems true of the *Letter on the China Root*, 1546; cf. Roth, *op. cit.*, pp. 76, 98 f., 216, who also notes the changes in grammar and punctuation which Vesalius made in the second edition of the *De Fabrica*, *op. cit.*, p. 232. [When this was already in proof there appeared H. Cushing, *A Bio-Bibliography of Andreas Vesalius*, 1943, which contains an English rendering of

The classical Latin style in which Vesalius ventured to formulate his findings made it rather difficult for the average physician of his day to understand the content of the *De Fabrica*. Many a contemporary reader must have wondered why Vesalius took this risk; he must have found it meaningless, if not ridiculous, that the great anatomist should have labored to veil his discoveries, the results of his empirical investigations, in the garb of so artificial a language.[7] But to a humanist, this procedure was a necessity. He believed that by recovering true and correct speech the road was opened to the recovery of true and correct knowledge. If Cicero set the standard of accurate Latin, it was necessary for the humanist to acquire the faculty of expressing himself in Cicero's language. In that famous manifesto of humanism, the preface to his book on the elegance of Latin, Valla gave voice to the conviction that inspired all humanists as regards their task and privilege: "Unhappy were the earlier centuries in which no erudite man was ever found; the more are we to be congratulated, for among us, if we exert our strength a little farther, then I trust the Roman language will soon flower even more than the city of Rome and together with the language all disciplines will be restored."[8] Under this supposition, it was only by writing Latin as he did that Vesalius was able properly to pursue

the prefatory letter to Vesalius' translation of Rhazes (pp. 4 ff.) and of the Postscript (pp. 6 f.) outlining his stylistic views referred to in this note.]

[7] Olschki, *op. cit.*, p. 99, is right, I think, in maintaining that it was on account of the complicated Latin of the *De Fabrica* that a German translation, "dem gemeinen Mann zu gut," was published in the same year in which the *De Fabrica* appeared; for the translation itself, cf. Roth, *op. cit.*, pp. 134 f.

[8] Cf. L. Valla, *Elegantiae Linguae Latinae*, 1480 (Rome), praefatio: "Superiora tempora infelicia fuere quibus homo nemo inventus est eruditus: eo plus his nostris gratulandum est: in quibus si paulo amplius annitamur confido propediem linguam Romanam vere plus quam urbem et cum ea disciplinas omnes iri restitutum"; for the significance of the document, cf. J. Huizinga, Das Problem der Renaissance, *Wege der Kulturgeschichte*, 1930, p. 92. Valla, perhaps not yet a fullfledged Ciceronian, though a follower of Quintilian, the apostle of Cicero, cf. G. Voigt, *Die Wiederbelebung des classischen Altertums*, I[3], 1893, pp. 463-64, believes that the Latin language was corrupted by the Goths, cf. *Elegantiae*, III, praefatio, and Norden, *op. cit.*, p. 770, n. 1. For Vesalius' agreement with such an explanation of the decay of ancient grandeur, cf. below, p. 554. The interrelationship between the restoration of language and the rise of science is nicely illustrated in Rabelais' *Gargantua*, II, 8, a passage to which my attention was drawn by Prof. L. Spitzer.

science, to approach the aim which he had set for himself—the resurrection of anatomy.

For there can be no doubt: however revolutionary Vesalius' achievement may seem to the modern historian, for him it was only the revival of the work of ancient anatomists. Anatomy, he says, " should be recalled from the dead, so that if it did not achieve with us a greater perfection than at any other place or time among the old teachers of anatomy, it might at least reach such a point that one could with confidence assert that our modern science of anatomy was equal to that of old, and that in this age anatomy was unique both in the level to which it had sunk and in the completeness of its subsequent restoration." [9] And he rejoices because " there is ground for hope that anatomy will ere long be cultivated in all our academies as it was of old in Alexandria." [10] Restoration of the dead past to a new life; Padua, the universities, a new Alexandria—this is the typical humanist concept of the rebirth of learning. The humanists were not " Mirnachs " like Paracelsus or Telesio or Cardano, they did not constantly shout " I say," " I have discovered for the first time." Their slogan was: " The truth was long since found, and has united noble spirits, do but grasp the ancient truth." [11] Once

[9] Cf. *De Fabrica*, praefatio, p. 3r, ll. 22 ff.: ". . . hoc naturalis philosophiae membrum ita ab inferis revocandum putavi, ut si non absolutius apud nos, quam alias unquam apud priscos dissectionum professores versaretur, eo tamen pertingeret, ut aliquando haud puderet asserere, hanc dissectionis rationem cum antiqua illa conferri posse: nostraque hac tempestate nihil simul ita collapsum, moxque integritati restitutum, ac Anatomen fuisse." (The translation of quotations from Vesalius' preface, given here and in the following, is that of B. Farrington, The Preface of Andreas Vesalius to the De Fabrica Corporis Humani 1543, *Proceedings of the Royal Society of Medicine*, XXV, 1932, pp. 1357 ff.).

[10] Cf. *De Fabrica*, praefatio, p. 3v, ll. 30 ff.: ". . . ut spes sit, hanc brevi in omnibus Academiis ita excolendam, quemadmodum . . . in Alexandria olim exerceri consuevit." To the importance which the concept of renaissance has for Vesalius—cf. e. g. praefatio, p. 3r, l. 30: ". . . medicinam prospere renasci vidimus . . ."—attention has been drawn by M. H. Fisch, Vesalius and his book, *Bulletin of the Medical Library Association*, XXXI, 1943, pp. 214 ff. But cf. below, n. 13.

[11] Cf. Goethe, *Vermächtnis*, ll. 7-9: " Das Wahre war schon längst gefunden, / Hat edle Geisterschaft verbunden, / Das alte Wahre fass es an! " / For the egotistic component in the philosophy of nature as evolved by Paracelsus and the others referred to here, cf. E. Cassirer, Die Antike und die Entstehung der exakten Wissenschaft, *Die Antike*, VIII, 1932, pp. 287 ff. Cassirer, in a recent article,

the Greeks had been in possession of the truth; now truth and perfection were reborn, they came to light again. This is the way in which the humanists, starting with Villani, viewed the contemporary development of art and literature. Michelangelo, for whom all Italy had become a new Greece, maintained in regard to modern artistic endeavor: "Our art is that of ancient Greece." Shortly before Vesalius, Vives methodically applied the concept of renaissance to the study of science as well.[12] Nor was Vesalius merely theorizing when he extended the same category to include anatomy. He knew from Cicero and from Celsus that the ancients had dissected human bodies; he learned from Galen that Alexandria had been the center of ancient anatomical research. Modern anatomy was indeed the resurrection of ancient anatomy.[13]

Giovanni Pico della Mirandola, *Journal of the History of Ideas*, III, 1942, p. 124, has also quoted the lines from Goethe as an appropriate motto for Pico's philosophy. It seems to me that they may well be taken as characteristic of humanism in general.

[12] Cf. in general W. K. Ferguson, Humanist Views of the Renaissance, *The American Historical Review*, XLV, 1939, pp. 1 ff.; and for Villani in particular, *ibid.*, pp. 19 f. For Michelangelo, cf. H. Grimm, *Leben Michelangelo's*, II[6], 1879, p. 306; his statement has been transmitted by F. de Hollanda, Vier Gespräche über die Malerei. Geführt zu Rom 1538, verfasst 1548. *Quellenschriften für Kunstgeschichte, Neue Folge*, IX, 1899. For the influence of humanist philosophy on Michelangelo, cf. Cassirer, *Individuum und Kosmos*, p. 143. Concerning Vives' *De Disciplinis* [1532] the first section of which (*De corruptis artibus*) deals with the history of scientific endeavor, cf. W. Rehm, Der Untergang Roms im abendländischen Denken, *Das Erbe der Alten*, XVIII, 1930, p. 68. Vives' importance for the development of Renaissance thought has been outlined by W. Dilthey, Weltanschauung und Analyse des Menschen seit Renaissance und Reformation, *Gesammelte Schriften*, II, 1923, pp. 423 ff.

[13] Cf. Cicero, *Academica*, II, 122; Celsus, praefatio, 23 ff. [Marx], and for Alexandria as the center of ancient anatomical studies, *e.g.* Galen, *Opera*, ed. G. Kühn, II, 1821, p. 220. Vesalius in four passages enumerates the names of the great Hellenistic anatomists in accordance with Galen's testimony, cf. Roth, *op. cit.*, p. 148, n. 5. Even Vesalius' interest in vivisection (cf. *De Fabrica* VII, chap. 19, Roth, *op. cit.*, p. 152)—the illustrations of the book, too, aim at representing the anatomy of the living body, cf. *e.g.* C. Singer, *From Magic to Science*, 1928, p. 108—has a parallel in the insistence of the Greek Dogmatists that vivisection is superior to dissection practiced on the dead body, cf. Celsus, praefatio, 23 ff. [Marx]. Modern scholars have sometimes doubted that the ancient testimonies concerning dissections are reliable. I do not see any reason for doing so, cf. L. Edelstein, The Development of Greek Anatomy, *Bulletin of the Institute of the History of Medicine*, III, 1935, pp. 235 ff. At any rate, in Vesalius' sources dissections of the human body were attested, and he was therefore justified in believing

But why did the knowledge that men had possessed of old deteriorate at all, and when did the decline begin? Vesalius dwells on these questions at some length. He opens his book with a survey of the history of medicine, or rather with an evaluation of those factors which are apt to retard progress in other sciences as well as in medicine. Isolation of the various branches of learning he considers disastrous; specialization, to him, means the impairment of knowledge; if theory and practice are divorced, nothing worth-while can be accomplished. Such a thesis certainly was not new. Cicero, Celsus, Galen had been preaching in the same vein.[14] Nor was it in any way a novelty that Vesalius attributed the decay of medicine and of anatomy in particular to the fact that physicians had ceased to perform dissections and had given up the practice of surgery. Galen, in almost the same words, had accused his contemporaries of endangering the pursuit of medicine. After Galen other physicians had used similar arguments.[15] The destructive tendencies to which Vesalius refers had long been operative in the history of science. But at a certain moment they were allowed free play and thus brought about ruin. "In bygone times," Vesalius asserts, "that is to say [in the West] after the Gothic deluge and [in the East] after the reign of Mansor at Bochara in Persia . . . medicine began to be sore distempered."[16] Does Vesalius propose this chronological fixation on the basis of his own investigations into history, or at least into the history of ancient and medieval medicine? From his medical studies

that his undertaking was nothing but the revival of the work of the ancients. That is why I cannot agree with Fisch, *op. cit.*, pp. 214-215, who says: ". . . he (*sc.* Vesalius) imagined for himself a pre-Galenic anatomy based on dissection of the human body . . . Thus it was still possible for Vesalius to preserve his reverence for antiquity and to regard his reformation of anatomy as a renaissance."

[14] Cf. Cicero, *De oratore*, III, 132; Celsus, praefatio, 47 [Marx], and Ilberg, *op. cit.*, p. 389; Galen, VI, p. 368 K., XIII, p. 604 K., and for the interpretation of these passages, cf. J. Ilberg, Aus Galens Praxis, *Neue Jahrbücher f. das Klassische Altertum*, XV, 1905, pp. 311 f.; 284.

[15] Cf. Galen, X, p. 455; XVIII A, p. 346; XIII, p. 604 K., and in general, Ilberg, *op. cit.*, pp. 283; 307. For more immediate precursors of Vesalius, cf. Roth, *op. cit.*, esp. pp. 9 ff.; 37 ff.

[16] Cf. *De Fabrica*, praefatio, p. 2r, ll. 18 ff.: ". . . quod aliquando, et praecipue post Gotthorum illuviem, Mansoremque Bocharae in Persia regem . . . medicina eousque lacerari cepit . . . ," cf. also, *ibid.*, l. 41: "maxime post Gotthorum vastationem."

he may have derived the notion that the Arabs up to the time of Mansor, that is up to the 9th century, remained in possession of true knowledge.[17] Yet his explanation of this fact immediately reveals the humanist bent of his thought. The Arabs, he contends, were able to stave off the downfall of medicine for such a long time because under Mansor they "still lived as was right on terms of familiarity with the Greeks."[18] In exactly this manner Ghiberti had traced the greatness of Cimabue's achievements to his painting in the *maniera Greca*, and from then on it became the watchword of the humanists that to do things perfectly meant to do them in the Greek fashion.[19] On the other hand, in dating the misfortunes of Western medicine from the invasion of Italy by the Goths, Vesalius merely adopted the chronology which the Florentine humanist Biondo had introduced into historical writing. Biondo explained the decline of ancient culture not through political changes such as the fall of the Republic and the rise of the Imperial regime, but rather through one historical event and its fateful consequences for mankind—the sack of Rome by the Goths.[20] In the time of Vesalius this opinion came to be generally accepted by the humanists. Based upon the division of history into Antiquity, Middle Ages and a New Age, it formed an integral part of the humanist teaching, while outside that orbit stu-

[17] That the Mansor referred to by Vesalius is the king whom Rhazes treated I have learned from O. Temkin. Vesalius edited Rhazes' *ad Almansorem* shortly before the publication of the *De Fabrica*, cf. above, n. 6.

[18] Cf. *De Fabrica*, praefatio, p. 2r, l. 19: "... sub quo Arabes nobis adhuc cum Graecis merito familiares vigebant ..."

[19] For Ghiberti, cf. Rehm, *op. cit.*, p. 68. There is a curious parallel between Vesalius' high estimation of the time of Mansor and Biondo's praise of the time of Charlemagne when, he thinks, a revival of the arts took place, cf. Ferguson, *op. cit.*, p. 13; for Biondo, cf. also following note. The humanists in general, of course, paid little attention to the development of culture among the Arabs. But such men as Pico della Mirandola whose influence on Vesalius seems certain, cf. below, p. 559, gave heed to the Arabs, cf. Burckhardt, *op. cit.*, pp. 184 f., who also stresses the specific concern of the physicians with Arabic studies. With Pico, Vesalius also shared an interest in Hebrew knowledge, cf. Singer, *Evolution of Anatomy*, p. 117; Cassirer, *Journal of the History of Ideas*, 1942, p. 125.

[20] Cf. Rehm, *op. cit.*, pp. 50 ff., and in general E. Fueter, *Geschichte der neueren Historiographie*, 1911, pp. 106 ff. Some of Biondo's views have now been traced to Petrarch, cf. T. E. Mommsen, Petrarch's Conception of "The Dark Ages," *Speculum*, XVII, 1942, p. 239. For the dependence of the humanists on Biondo's work, cf. Fueter, *op. cit.*, p. 109.

dents kept on writing world history according to the periods marked off by the succession of the Four World Monarchies.[21] No doubt, the views of Biondo reflect what nowadays is often called the humanist bias against the Middle Ages as the time of darkness, and on these grounds one might aver that Vesalius only repeats the prejudices held by his friends.[22] But one should not forget that the humanist periodization of history had been a liberating deed. The condemnation of the centuries immediately preceding their own implied high hopes for human progress and human happiness in the "Golden Age" in which men were now living. Vesalius, too, speaks of his time as a "felicitous age," and the optimistic view of the present and

[21] Cf. Fueter, *op. cit.*, pp. 182 ff. This fact is important because it proves that Vesalius consciously chose the side of the Italian humanists and rejected other theories still in vogue in his time. Incidentally, before Vesalius, Vives, in his description of the breakdown of ancient science, had made use of the humanist periodization of history, cf. Rehm, *op. cit.*, p. 68, and above, n. 12. The interpretation of Vesalius' views given here is at variance with that of B. Farrington, Vesalius on the Ruin of Ancient Medicine, *The Modern Quarterly*, I, 1938, pp. 23 ff. According to him, Vesalius blames the decay of anatomy on "the aristocratic prejudice against manual labour," on "the prejudices of a slave-owning aristocracy" (*op. cit.*, pp. 25, 27). True, Vesalius considers it detrimental that medicine once was divided between physicians and slaves in such a way that the latter performed all manual tasks (*De Fabrica*, praefatio, p. 2r, l. 44). But this was not the necessary consequence of ancient slave economy—for centuries physicians had practiced surgery and performed dissections—it was the concomitant result of the invasion of Italy by the Goths, "when all the sciences, which before had flourished gloriously and were practised as was fitting, went to ruin" (praefatio, p. 2r, l. 42). Vesalius' words, then, have "social significance" (Farrington, *op. cit.*, p. 23), but "the cause" (*ibid.*, p. 25) of the ruin of ancient anatomy does not lie in social factors. Moreover, the humanist Vesalius naturally compared the attitude toward medicine arising after the sack of Rome to that of the ancient Romans. Tradition had it that they fought wars and tilled the soil but left all handicrafts to slaves and foreigners (cf. Dionysius of Halicarnassus, *Antiquitates Romanae*, II, 28, 1-2). Only in those centuries in which the Romans, just as the Arabs (cf. above, n. 18), "lived on terms of familiarity with the Greeks," was the condemnation of arts abandoned. Again, the final decay of medicine started in Italy and extended only gradually to the other parts of the world (praefatio, p. 2r, ll. 43 ff.), because the devastation of Rome and the destruction of ancient culture first made itself felt in Italy. In all these instances, it seems to me, Vesalius reasons as a thorough humanist, not as a social thinker or a historian in his own right as Farrington contends.

[22] Thus Thorndike, *op. cit.*, p. 523, says: "... shouldering the blame [for them] upon the preceding mediaeval period, concerning which he seems to have had more humanistic prejudice than accurate knowledge."

even of the future which pervades his utterances is, I think, to some extent the result of his humanist philosophy of history.[23]

The fulfillment of Vesalius' dreams necessitated courageous opposition to the traditional authorities, above all to the predominance of Galen. Vesalius was well aware of this fact, and even those who were wont to defend Galen, he jubilates, "drawn by the love of truth, gradually abandon that attitude and, growing less emphatic, begin to put faith in their own not ineffectual sight and powers of reason rather than in the writings of Galen. These true paradoxes, won not by slavish reliance on the efforts of others, nor supported merely by masses of authorities, they eagerly communicate . . . to their friends." [24] In his endeavor to restore anatomy to its old glory, Vesalius, then, relied on original research, on observation and investigation. He did not take refuge in books, he intended to read nothing but "the book of the human body that cannot lie." [25] To be sure no writings were preserved which he could follow. The works of the ancient anatomists who had dissected human cadavers were lost; as Vesalius maintains, they were destroyed by envious people who grudged later generations the enjoyment of the truth.[26] Yet it is not a subterfuge which the humanist Vesalius is using when he

[23] Cf. *De Fabrica*, praefatio, p. 3r, ll. 15-16: huius seculi . . . foelicitate, and for the concept of the "Golden Age" in Renaissance humanism, Burdach, *op. cit.*, pp. 105 f. It is true, the humanists often were "Kulturpessimisten," that is, they expected a new decay to follow their own achievements (cf. in general, Rehm, *op. cit.*, pp. 68 ff., and Michelangelo's gloomy prediction in his conversation with Francesco de Hollanda, *op. cit.*, p. 307). But apart from the fact that their fears concerned not their own generation but those to come, they were based on a theory which explained the ruin of the past by the inevitable cycle from democracy to tyranny; in other words they presupposed Villani's concept of history, not that of Biondo which was shared by Vesalius, cf. above, p. 554. Still, catastrophes like the sack of Rome must not necessarily recur and culture, therefore, may not be drawn into another cataclysm.

[24] Cf. *De Fabrica*, praefatio, p. 3v, ll. 26 ff.: ". . . hi veritatis amore ducti, paulatim inde mitescant, suisque oculis ac rationibus non inefficacibus plus fidei, quam Galeni scriptis adhibeant, haec vere paradoxa non ab aliis autoribus emendicata, neque autoritatum congerie tantum firmata, . . . ad amicos sedulo perscribentes . . ."

[25] Cf. *De Fabrica*, p. 600, l. 42: ". . . paradoxa ex hominis haud mendaci libro deprompta . . ."; cf. Roth, *op. cit.*, p. 117, n. 5. The expression "book of nature" appears before Vesalius, cf. Roth, p. 68, n. 5; 125, n. 3. But the term "book of the human body" seems original with him.

[26] Cf. *De Fabrica*, praefatio, p. 3r, ll. 51 ff.

recommends the study of nature. On the contrary, it is precisely by asking men to employ their own faculties that Vesalius proves himself to be a true humanist. Not because Cimabue had imitated Greek paintings did Ghiberti call him the reviver of art, the painter who had restored the *maniera Greca*—no Greek pictures existed which Cimabue could have copied. Nor did Michelangelo say of Italian art that it equalled the artistic skill of the Greeks because he and his contemporaries imitated the statues excavated in the gardens of the Vatican.[27] Ghiberti, the theorist, and Michelangelo, the creative genius, founded their judgment on the fact that Cimabue and all the other Italian artists had studied and followed Nature who had also been the teacher of the Greeks, that like the Greeks they had trusted "their own not ineffectual sight and powers of reasoning." Humanism was a call to self-reliance.[28] The role of the Greeks was only that of giving encouragement through their example. If such support is needed by everybody who dares to be independent, it was especially longed for by that generation which, after centuries of bondage, for the first time ventured to shake off the yoke of authority. Thus Copernicus in the same year in which Vesalius published the *De Fabrica* confessed in his book *De Revolutionibus* that, dissatisfied with the system of Ptolemy, he eagerly read the ancient authors to see whether any of them had proposed other theories. When he found mention of the Pythagorean doctrine, according to which the earth was moving whereas the sun was at rest, he began to ponder over such a possibility because "to others before him had been given the same liberty."[29] The reversal of anatomical studies no less than the reversal of astronomical research was instigated by scientists who in the emulation of others found their own freedom.

But humanism did not only rid men of the dust of books, it did not only open their eyes to the world, it also made them see man and

[27] For Ghiberti, cf. above, n. 19; for Michelangelo, cf. also A. Hekler, Michelangelo und die Antike, *Wiener Jahrbuch für Kunstgeschichte*, VII, 1930, pp. 201 f.

[28] Burdach, *op. cit.*, pp. 164 f., has pointed out most clearly that humanism does not mean imitation but study of the objects themselves.

[29] Cf. Copernicus, *De Revolutionibus*, praefatio (Thorn, 1873), p. 6, ll. 16-17: ". . . quia sciebam aliis ante me hanc concessam libertatem . . ." Note that the works of the mathematicians with whose theories Copernicus concerned himself were lost as were the books of the ancient anatomists whom Vesalius admired.

the world as nobody before had ever done. How strongly Vesalius was influenced by this new attitude seems evidenced by the novel meaning which he gave to anatomical studies. Of course, in his opinion, too, anatomical findings are principally of concern to the physician. Medicine without anatomy cannot flourish. The physician who does not know the structure of the human body cannot succeed in healing diseases, as the ancient Dogmatists had already claimed. [30] Besides, anatomy is important for the philosopher and the theologian. Vesalius is conscious of the fact that in antiquity philosophers had investigated cadavers, and he notes the attention paid to his science by philosophers and divines of his time.[31] But it is not only for the physician and the philosopher and the doctor of theology that he intends to write. Addressing Charles V in the preface of the *De Fabrica*, he takes it for granted that the Emperor will find delight in the anatomical book that is dedicated to him. Charles had always been fond of mathematics and especially of astronomy. So great was his interest "that it can hardly be but that as you are attracted in an unique degree by the science of the universe, so also you should at times delight in considering the most perfectly constructed among all created things, and should take pleasure in considering what is the temporary dwelling-place and instrument of the immortal soul. For this in many particulars exhibits a marvellous correspondence with the universe, and for that reason was by them of old not inappropriately styled 'a little universe.'" [32] Yet Vesalius goes farther. "I am of opinion," he says, "that out of the whole

[30] Compare *De Fabrica*, praefatio, p. 2v, ll. 46 ff., with Celsus, praefatio, 23 [Marx].

[31] Cf. *De Fabrica*, praefatio, p. 4v, l. 6. For the interest of ancient philosophers in anatomy, cf. L. Edelstein, Die Geschichte der Sektion in der Antike, *Quellen u. Studien z. Geschichte d. Naturwissenschaften u. d. Medizin*, III, 1932, pp. 67 ff. Thorndike, *op. cit.*, p. 526, understands Vesalius' remark about the theologians, *De Fabrica*, p. 531, ll. 22-23, as an "unkind cut." But the problem of generation was a main topic of Aristotle's and Galen's biological studies and a legitimate subject of theological speculation. Even Dante, *Purgatorio*, XXV, 37 ff., does not refrain from such discussions, cf. Olschki, *op. cit.*, p. 100, n. 2.

[32] Cf. *De Fabrica*, praefatio, p. 4v, ll. 1 ff.: "... quin ut mundi scientia unice teneris, ita etiam aliquando omnium creaturarum absolutissimae fabricatione expendenda delecteris, et immortalis animae diversorio ac instrumento considerando voluptatem capias: quod domicilium, quia permultis nominibus mundo egregie correspondet, veteribus haud ab re microcosmus nuncupabatur."

Apolline discipline, and indeed out of the whole philosophy of nature, nothing could be fashioned more pleasing or more acceptable to Your Majesty than an account from which we learn of the body and of the mind and furthermore of a certain divine power consisting of the harmony of both, in sum, of ourselves, whom to know is man's proper study." [33] And though Vesalius has decided that this is not the place for glorifying a knowledge of the structure of the human body he cannot refrain from adding that it is "the knowledge most worthy of man and in itself by far the most commendable for him." [34] Not astronomy, not the world, but man, the worthiest object of human inquiry, the proper concern of every human being—hardly anyone but a humanist of the Renaissance could have made this assertion; it seems understandable only within the framework of humanist philosophy and its concept of the dignity of man.[35]

True, just as the ancients and as men of the Middle Ages, so the humanists, and with them Vesalius, call man a microcosm. Pico della Mirandola himself says: "It is a commonplace of the schools that man is a little world in which we may discern a body mingled of earthly elements, and ethereal breath, and the vegetable life of plants, and the senses of the lower animals, and reason and the intelligence of the angels, and a likeness of God." [36] But for Pico and

[33] Cf. *De Fabrica*, praefatio, p. 4r, ll. 47 ff.: ". . . augurer, ex universa Apollinea disciplina, adeoque tota naturali philosophia, nihil tuae Maiestati gratius acceptius ve procudi posse, historia, qua corpus et animum, ac praeterea divinum quoddam numen ex utriusque symphonia, et nosmetipsos denique (quod vere hominis est) cognoscimus."

[34] Cf. *De Fabrica*, praefatio, p. 4v, ll. 4-5: ". . . uti modo homini dignissimam sui corporis structurae cognitionem, per se longe commendatissimam, . . ." Farrington translates this passage as follows: "worthy as it is of the attention of man, and in itself to be commended above all others." But such a rendering, it seems to me, does not do full justice to the peculiar flavor of the words.

[35] At least as far as I am aware, the motivations for a study of the human body as given in antiquity and in the Middle Ages are different. They are derived from scientific or philosophical considerations, cf. above, n. 30 and 31, or from a natural interest of man in his body, cf. L. Edelstein, *op. cit.*, pp. 65 ff., or from a certain standard of education similar to that set up even by Melanchthon who says: Turpe est homini prorsus ignorare sui corporis (ut ita dicam) aedificium; *De anima*, Basil. 1543, p. 423; Roth, *op. cit.*, p. 244, n. 4.

[36] Cf. Pico della Mirandola, *De dignitate hominis:* "Tritum est in scholis esse hominem minorem mundum, in quo mixtum ex elementis corpus et spiritus coelestis et plantarum anima vegetalis et brutorum sensus et ratio et angelica mens et Dei

the humanists, the idea of man as a microcosm acquires a more exalted meaning. Man is no longer a link in a chain that stretches from heaven to earth. God and angels no longer rank above him, nor are animals and plants beneath him—he is apart from everything. For man is not to be compared with other beings, he is his own free creator and conqueror, he alone is endowed with development, with growing according to his own free will, he has in himself the seeds of an omnific life, and this pre-eminence constitutes his unique dignity.[37] Consequent to such a belief, the representation of man became the supreme task of Renaissance art. Sculptors and painters vied in forming the likeness of the new Prometheus, because he was the subject most deserving of their skill. Philosophers and scientists wrote about the dignity of man, and even in the structure of his body they discovered not so much the providence of God, but rather the excellence of the human being.[38] In the same vein Vesalius declared the study of the human body to be the proper task of man, the worthiest study of all that can be pursued by him. This saying aphoristically summarizes the humanist philosophy. It

similitudo conspicitur." I quote from W. Pater, *The Renaissance*, 1910, p. 40 (Pico della Mirandola). The translation given in the text is also that of Pater. For Vesalius, cf. *De Fabrica*, praefatio, p. 4v, l. 4: microcosmus; p. 636, ll. 29-30: ". . . quod nobis rationalem animam, quam cum angelis (ut Plato etiam male tractatorum philosophorum haud immememor innuebat) communem habemus, largitus fuerit (*sc.* Deus rerum omnium opifex)." Roth, *op. cit.*, p. 179, and Olschki, *op. cit.*, p. 98, n. 1, on account of the latter statement, consider Vesalius a Platonist. But this he is only in so far as Platonism is integrated into Pico's philosophy and Renaissance thought in general.

[37] Cf. Pico, *op. cit.* The importance of the passage referred to here for the Renaissance concept of man was first recognized by Burckhardt, *op. cit.*, pp. 330 f. The philosophical implications of Pico's oration have been discussed in more detail by Cassirer, *Individuum und Kosmos*, pp. 88 f.; cf. also Burdach, *op. cit.*, pp. 168 f.

[38] Concerning Renaissance art and the ideal of the new Prometheus, cf. Burdach, *op. cit.*, pp. 166 f. For reflections of the humanist evaluation of man's position in scientific inquiry, cf. such books as that of Magnus Hundt, *Antropologium de hominis dignitate natura et proprietatibus de elementis, partibus et membris humani corporis*, 1501, and G. Manetti, *De dignitate et excellentia hominis*, written in 1452 and published in 1532; the significance of the latter book in the development of Renaissance thought has been pointed out by G. Gentile, *Giordano Bruno e il pensiero del Rinascimento*, 1920, pp. 154 ff. The second book of Manetti's treatise deals with the fabric of the human body, cf. Gentile, *op. cit.*, p. 166; for Manetti, cf. also Cassirer, *Individuum und Kosmos*, p. 88.

is symbolic of the pride of that generation, of its belief in the "empire of man," who finds his destiny in himself, not in God.[89]

I trust I do not overstate my case when I maintain that Vesalius was not only a classical scholar, that he did not only wear the robe of the humanist, but that he also professed the main articles of the humanist faith. The *De Fabrica*, whatever it may be in other respects, is also a living testimony to the fact that the scientist Vesalius had joined the fellowship of the humanists.

[89] I am not sufficiently familiar with Renaissance literature to say with assurance that no such phrase as that used by Vesalius may be found in books written before the *De Fabrica*. At any rate, Vesalius' statement ought to be considered another modification of that feeling which was first expressed in Socrates' ἀνθρώπινα λέγειν, cf. Xenophon, *Memorabilia*, I, 1, 11 ff., and became immortalized in Pope's lines: "Know then thyself, presume not God to scan, / The proper study of mankind is man," An Essay on Man, *Epist.*, II, 1-2. The commentaries on Pope, cf. *The Works of A. Pope*, ed. by J. W. Croker and W. Elwin, II, 1871, *ad loc.*, and the thesauri, cf., *e.g.*, *A Dictionary of Quotations from Authors Old and New*, Everyman's Library, I, p. 187, give as "sources" only Charron, *De la sagesse*, 1601, I. chap. 1: la vraye science et le vray étude de l'homme c'est l'homme, and Pascal: . . . l'étude de l'homme, et que c'est la vraie étude qui lui est propre, *Pensées*, ed. by L. Brunschvicg, II, 1904, p. 71, section II, 144. To the Socratic resignation shared by Pope; to Pascal's humility in rejecting science in favor of a search into the human heart; to the passion of truth by which Charron is inspired; Vesalius' formula adds the Renaissance ethos of confidence in man's value and the scientist's admiration for the perceptible matter in which the human spirit dwells.

PSYCHOLOGICAL SIDELIGHTS ON ANDREAS VESALIUS

GREGORY ZILBOORG

It might be claimed that Guy de Maupassant was fully justified when he objected to the publication of his portrait with the words, "Only our works belong to the public, not our faces." But Maupassant's assertion can be accepted only with some qualifications. It is true that no useful purpose is served by the exposure of the artist's or scientist's personality to the gaze of curious contemporaries. These are not in a position to evaluate objectively the artist or scholar who lives in their midst as an equal—endowed with genius, to be sure, but also with all the human frailties. It would hardly have helped the contemporaries of Michelangelo to understand his Pieta or his paintings on the ceiling of the Sistine Chapel, if his private life, his melancholy, his moments of rancor and periods of desolation had been revealed to them; it certainly would have caused Michelangelo added and unnecessary spiritual torment. Little would be gained by our knowledge of the private life of Einstein; neither his theory of relativity nor his public spirit would become clearer to us.

On the other hand, the historian finds it almost imperative to understand not only the contributions of the great masters of arts and science but also their personalities. Their faces, indeed their innermost lives, while not belonging to their contemporary populace do belong to history. Paracelsus may have been a very unpleasant, difficult person to get along with; he was judged severely by his well-mannered contemporaries, and perhaps deservedly so. But the historian today can see in Paracelsus' temperament and temper the reflection of the accumulated, irreconcilable opposition to the vested interests and stand-pattism of sixteenth century academic and clinical medicine. The historical perspective offers us an opportunity to see how the whole tempestuous, rasping and burning, rough and pounding personality of Paracelsus was the true vehicle of the great revolution which was maturing in his time and which he carried out with such force and self-sacrifice. To the historian the coarse and uncom-

promising language of Paracelsus is the language of a historical epoch and not that of an ill-mannered person who could not get along with the polished and neatly complacent, bookish academicians of the University of Basle. To the psychiatrist of later centuries Paracelsus may well appear to be a psychopath whose quixotic peregrinations and aggressiveness and scurrilous surliness verged on the truly pathological, but to the historian the very psychopathy of Paracelsus is a fitting manifestation of that burning social protest, of that scornful spiritual rebellion, which contributed so much to the cultural and scientific progress of medicine toward the middle of the sixteenth century.

According to the standards of the self-satisfied vested medical interests of the time, from the standpoint of the medical Babbits of yore and even of some today, Paracelsus may even be considered a total failure. Did he not fail to make a living? He was a pauper, literally in rags. But from the standpoint of the historian this total failure is a part of the truly heroic nature of the struggle which Paracelsus led, and to the exertion of which his physical remains finally succumbed prematurely. His "failure" adds to rather than subtracts from the man's honorable place in the history of medicine and culture. In brief, the understanding of the intimate structure of a given historical personality tells us a great deal about the specific impact a given historical problem happens to possess, and the reactions of this personality tell us of the force with which this problem was met. The understanding of the person behind the great contributions to our culture becomes a prerequisite and an integral part of whatever understanding of history we may gain.

It is therefore pertinent that on the four hundredth anniversary of the publication of Vesalius' *De Fabrica* we should not only review the basic scientific contribution of Vesalius and the revolution it wrought in the practice of medicine, in medical education, and in our knowledge of man, but also ask ourselves what manner of man was this Andreas Vesalius, who between the ages of twenty-two and twenty-nine rose to unprecedented heights of scientific achievement, and then for the subsequent twenty years went on to live scientifically an almost sterile life, to die as suddenly as his career had died abruptly twenty years before.

We do not possess any complete biography of Vesalius. His life and his personality still appear to us rather shadowy and nebulous in outline. This is certainly not due to the fact that generations of students of the Renaissance for some reason chose to neglect the personality of Vesalius. Few of his active contemporaries seem to be so little known, as persons, to the present-day student of that period.

This very fact would suggest that Vesalius may have been an exception in some of his character traits. Apparently, he revealed himself very little if at all to others, and he may have been what we term today a shut-in, schizoid person. Personalities of this type are rarely well known to anyone around them, even to those who as a result of years of acquaintance and professional contact should know them very well. That this must have been true of Vesalius is suggested by the statement of a contemporary who wrote: *Vesalius natura taciturnus et melancholicus.*[1] There is additional, although seemingly negative, evidence testifying to Vesalius' rather withdrawn, melancholic personality. There were few prominent and active people in his day who did not leave behind them an extensive correspondence which reflects both the intimate and the intellectual nature of the writers as well as their scientific preoccupations and their attitudes toward the burning problems of their day—the problems of those days were almost all burning and they seldom failed to involve the active individual, whether artist or scientist, in inner self-queries or actual struggle on one or the other side of the contending forces. The older contemporary of Vesalius, Cornelius Agrippa, left a voluminous correspondence. So did his pupil, the founder of clinical psychiatry, Johan Weyer. So did Vives, and Erasmus, and More, and Michelangelo.

Vesalius' contact with the great men about him seems to have been remote; unlike most of the contemporaries of his stature and position who were prolific writers, he wrote very little and corresponded less. In the course of the twenty years after he abruptly left Padua, and Italy, to serve as physician to Charles V and then Philip II, Vesalius wrote a brief commentary on the work of Fallopius and another small contribution on the China root. The com-

[1] In a letter of May, 1566, written by Reinerus Solenander, cited by Roth: *Andreas Vesalius Bruxellensis*, 1892, p. 190.

mentary on Falloppius was rather personal, its introductory part is even nostalgic and melancholy, and yet it sounds remote in that it reflects a passive resignation rather than a striving to establish and remain in contact with people. Vesalius did take pains to forward his commentary to Falloppius, his successor in the University of Padua, through the Venetian ambassador Tiepolo, but here too he appears remote. The message never reached Falloppius, who had died in the meantime, but Vesalius did not learn of this until about three years later, when he revisited Venice for a brief period; he does not appear to have made any inquiries up to that time. Corresponding was not so easy then as it is now, yet it was not so difficult as to warrant the passivity, or inactivity, which Vesalius showed in this respect. His taciturn, melancholic nature apparently kept him more in formal than in substantial contact with people and the outside world.

As has already been suggested, Vesalius was also an exception in that he seems to have reacted very little to the problems of his day. The artists and scholars and society lions and monks of his generation were mostly tempestuous people; their lives could not easily be separated from their work, nor their work from the combat in which they almost invariably took part. This is true of the tortured Michelangelo as well as of the rascal Aretino, whom Vesalius might have met in Venice; Aretino never failed to meet anyone of consequence in order to get something out of him, frequently by means of charm, mostly by resort to refined or crude blackmail. The intimate and more often than not violent participation in the struggle that was the Renaissance was characteristic of Ignatius Loyola (whom incidentally Vesalius did meet in Venice) as well as of Agrippa and Weyer, who have already been mentioned. It was certainly typical of Paracelsus, and of Servetus, who was burned by Calvin ten years after the appearance of *De Fabrica*.

Vesalius, however, was no fighter. To be sure, he did not conceal his opposition to Galen and the Galenist, but his opposition was purely factual, most of the time rather cautious and almost hesitant. He seldom was fully and outspokenly aggressive. At the height of his career as a dissector and teacher, he did not stay to fight it out with his opponents. He did call his former pupil and deputy in the

University, Realdus Columbus who turned Galenist, "a man of half-knowledge," but he preferred ultimately to retire. Only a short while before his final departure from anatomy, Vesalius professed that "he who espouses science must not marry a wife; he cannot be true to both." Then he suddenly abandoned everything, ended his career as a searcher for new facts, and went into the stifling service of Charles V. A year later he was married.

The suddenness with which he ended his scientific career and the intensity with which he made his exit from academic life do not seem in harmony with the taciturn and melancholic cast which Vesalius presented, yet from the psychological point of view this tempestuous episode fits in with his withdrawn, shut-in personality. Such shut-in persons seldom perform any transition from one mode of living to another, but if they do, they do it impulsively, aggressively, destructively. Twice in his life Vesalius changed his mode of living, and both times suddenly and with disastrous results.

When he dropped his career as anatomist he destroyed his own professed ambitions to remain faithful to science, and he burned his most valuable books: a heavy volume of his own annotations to Galen, the *Paraphrasis* of Rhazes on which he had worked and made marginal notes, and another book in which were collected a number of medical recipes.

The second transition effected by Vesalius was as sudden. He left the Court of Philip II and repaired to the Holy Land; shortly thereafter he was reported in dire need and hungry, and within a few weeks he was dead on a little island off Greece.

Characteristically, and in melancholy harmony with the withdrawn personality of Vesalius, there is no authentic word as to the reasons why he left Madrid, why he went to Jerusalem, or why he died. He was married and the father of a child, but nothing is known of his attitude toward his wife and daughter. He left Madrid with his wife, but they soon parted; his wife went to Brussels and he proceeded to Venice, and from there to the Holy Land. His wife remarried soon after she heard of his death.

All this testifies to the certain tenuousness in human relationships which characterized Vesalius; he seems to have been attached to very few people and to have awakened few lasting emotions in others

toward him. There appears to be a considerable amount of more than presumptive evidence to the effect that Vesalius was truly a schizoid individual, a man potentially capable of concentrating on a single purpose—outwardly composed even though melancholy, inwardly disturbed and restless and uncertain and unable to develop a true and lasting grip on reality. One might presume with considerable justification that, had he not been born into a family of medical tradition and during the Renaissance, he would most probably have become an intellectually sterile, taciturn monk and would have left no memory to posterity.

Very early, at the tender age of fourteen, Vesalius showed an active interest in cutting animals open; he would catch mice, moles, rats, dogs, and cats and proceed to dismember them. To look upon this propensity as a sign of Vesalius' precocious interest in anatomy, as some are inclined to do, is certainly not justified. At that time, in 1529 or 1530, in Brussels or Louvain, anatomy was certainly not so popular a subject that it would percolate with such force into the mind of a fourteen-year-old youngster. One is rather inclined to think of this interest in the dismembering of animals as a purely personal trait of Vesalius, which at its inception had nothing to do with anatomy. That this trait finally evolved into a scientific passion there is no doubt, but there is also little doubt that originally it was the expression of a singular psychological trend which would be not much less striking and peculiar even in a fourteen-year-old boy of today, and that it was not a self-conscious intellectual interest. It was rather an emotional inclination, a drive, a need *per se* which was later transformed into or utilized by the intellectual, cultural, and scientific interests of the mature Vesalius. The history of the psychobiological evolution of man in the course of his individual development from infancy to adulthood, and in the course of our cultural growth from primeval savagery to civilization, offers numerous instances of destructive, primitive, sadistic drives which gradually became transformed into higher modes of functioning.

It is significant that Vesalius showed these primitive trends so early, but not because they foreshadowed his future development into an anatomist and surgeon—for under different social and cultural circumstances he might have become a butcher. From the

psychiatric point of view, his early interest in dismembering and cutting animals open represents a rather complex set of primitive, destructive drives which if sufficiently strong, even if on occasion utilized for purposes of higher pursuits, do ultimately produce depressive states which may in turn become severe enough to be recognized as pathological.

From this point of view, it is extremely instructive to observe how his primitive drives lent strong psychomotor support to Vesalius' interest in anatomy, in such a manner that his fascination with the subject went beyond that of his teachers Sylvius and Guinterius. At the age of fourteen these drives made him cut up rats and cats, but at seventeen and eighteen they made him leave his student bench, discard the dull recitations of Galen's text, stand up before his professors and several hundred students, snatch the knife from the hand of the barber, and undertake himself to dissect the cadaver in his own bold and searching way. During a period of some eleven or twelve years Vesalius worked under the spell of this intense drive for which he found such a happy outlet, almost completely converting the primitive, infantile, sadistic drives into highest endeavors; neither the skepticism of his friends nor the open hostility of his colleagues and teachers seemed to deter him from his purpose. He stood before life as if the conqueror of death itself, because it was out of the dead and decomposing body that he read the mysteries of living human functioning. He seems to have been truly inspired during that period, as if possessed by a single impulse, bent on the achievement of a single ambition.

The exclusive concentration on one single idea or path is very characteristic of many schizoid individuals. Vesalius roamed through the Cemetery of Innocents in Paris gathering human bones. He stole into the places of execution, such as Montfalcon, in order to steal the bodies of the executed, not infrequently competing for the prize with predatory dogs. Later, in Padua, he would carry parts of a cadaver into his lodging to continue to dissect and study alone at night, away from his students and colleagues. "He ingratiated himself with the judges, so that when a criminal was condemned to death they gave directions that the sentence should be carried out at such a time, and the execution should be conducted now in this

manner, now in that as might best meet the needs of Vesalius' public dissections." [2]

He was the captive of his strange necro- and coprophilic drives. No wonder he felt married to his work and faithful to it and felt he could not marry a wife. Anatomy became at once his wife and his ascetic ideal. Affluence and other comforts of life were of secondary if of any importance, but he spent money freely to secure good drawings for his *De Fabrica*, which became the very substance not only of his intellectual scientific but emotional achievement as well. Some twenty years later, when writing his *Examen* of the work of Falloppius, he could look back and say with full sincerity that reading Falloppius brought back to him " a glad and joyful memory of that most delightful life which, teaching anatomy, I passed in Italy, the true nurse of intellects, . . . [looking forward to seeing] the ornaments of our science continue to bud forth in the school from which I was, while yet a youngster, dragged away to the dull routine of medical practice and to the worries of continual journeys. I look forward to the accomplishment of that great work for which, to the best of my powers so far as my youth and my then judgment allowed, I laid foundations, such that I need not be ashamed of them." [3]

These words sound as if they were written by an old, disappointed man whose youth was so far behind him that all he had were memories of the past and the present sense of senescence and of the approaching end. Yet Vesalius was but a little over forty-five years old when he wrote these lines. Only seventeen years lay between him and that day when he had put an end to his career in Padua. One can easily imagine how hopeless and benumbed and senescent he must have felt, if at the age of forty-five he could retrospectively visualize himself as an almost fragile youth, when he actually was already a mature genius of twenty-nine. At forty-five he seemed to wish to recapture a vision already gone, giving himself " wholly up to the instant, greedy reading of the pages " of Falloppius. It may

[2] M. Foster: *Lectures on the History of Physiology during the Sixteenth, Seventeenth and Eighteenth Centuries.* Cambridge, University Press, 1901, pp. 9, 10.

[3] *Ibid.*, p. 18.

also be noted that, in conformity with the psychology of shut-in, schizoid, depressed individuals, he looked back on his days in Padua and completely failed to mention his own impulsive way of abandoning his career. Instead, it appeared to him that circumstances and people beyond his control were responsible for his sudden change of life. He speaks of himself as "a youngster dragged away to the dull routine of medical practice," as if as a child he had been kidnapped from his nurse never to be returned to his home, to "Italy, the true nurse of intellects"—as if during the seventeen years spent in "the dull routine of medical practice and worries of continual journeys" he was unable to find the energy and courage to recapture and resume the life he had led for a little more than half a dozen eventful, productive, and momentous years as a teacher of anatomy. Almost by way of melancholy, rhetorical hopelessness he adds: "I still live in hope that at some time or other, by some good fortune, I may once more be able to study that true bible, as we count it, of the human body and of the nature of man."[4] This was written in 1561. A little over three years later, early in 1564, he visited Venice fleetingly; he came there not to re-establish himself in the country where he had done his best work, his only great work, but to pass through the city on his way to Jerusalem and to death.

At the present state of our knowledge it is impossible fully to reconstruct the psychological life of Vesalius during his years of service at the Court of Charles V. It would seem that, his ambition fulfilled with the publication of the *De Fabrica*, he became depressed. So many people of this type become depressed at the very peak of their success, as if it is achievement rather than failure that breaks them down. It is one of the psychological paradoxes which modern clinical psychiatry has learned to understand. During the twelve-odd years in which he served Charles V, Vesalius followed the Emperor in military campaigns and political journeys. He still had occasional opportunities to perform autopsies (while outside of Spain), thus keeping in somewhat loose contact with the object of his chief interest, but his was no more a creative life; it is puzzling and striking to observe to what extent Vesalius became spiritually dulled and sedate during these years. There was a flicker of interest when the

[4] *Ibid.*, p. 18.

second edition of *De Fabrica* was issued in 1555, but the great lecturer in anatomy and the masterful dissector and observer was now little more than a courtier who was close to the person of the ruler. He interceded with the Emperor in favor of a book-printer, Herwagen, who wanted to have the title of Imperial Notary, or in favor of another book-printer, Petri from Basle, who was eager to have a title.

In 1556 Charles retired from worldly affairs and Vesalius, as if in a rut, permitted himself simply to be shifted to the service of Philip II. Three years later Philip returned to Madrid. Here Vesalius' frequent travels came to an end, and even his tenuous contacts with anatomy were broken. It was in Madrid that he wrote his *Examen* of Falloppius, but he had to do it from memory, for he was unable to verify his assertions on anatomical specimens. He "could not lay his hand on so much as a dried skull, much less have the chance of making a dissection." [5] It is very puzzling indeed to find that Vesalius apparently failed to keep for himself even one set of bones. Seemingly, not a tangible vestige of his past and major passion was left about him; he failed to preserve one.

This complete even though gradual divorcement from anatomy and from dissections was apparently not the cause but primarily the result of a long process of deterioration of Vesalius' energy and life interests. One may guess and speculate about the specific nature of this psychological process, but it does seem clear that Vesalius never recovered from his success in Italy and never made peace with himself after the spectacular self-imposed failure with which he countered his great success. He remained depressed and he passively followed the path of psychological involution. There are actually several specific factual allusions to the effect that, at the early age of forty-nine or fifty, he showed signs of terminal psychological withdrawal from the world. One can see this even in the little we know about his leaving Madrid, his journey to Jerusalem, and his death.

Although here again nothing authentic is known, on the basis of psychological coherence certain aspects of Vesalius' psychology can be partially reconstructed.

It is doubtful whether one can credit the story offered by Hubertus

[5] *Ibid.*, p. 17.

Languetus, who on January first, 1565 wrote Kaspar Peucer that Vesalius died while on his way from his pilgrimage to the Holy Land. According to Hubertus, Vesalius had got into trouble because it was discovered that while performing an autopsy on a nobleman he found the heart still fluttering. The Inquisition was allegedly ready to prosecute and demanded the head of the dissector; Philip intervened and Vesalius was permitted to expiate his sin by a pilgrimage to Jerusalem.[6] Ambroise Paré relates a similar story. Paré does not mention Vesalius by name, but he alludes to him rather transparently and says that it was a noble lady on whose body Vesalius was performing an autopsy. These are most probably apocryphal stories; Vesalius in Madrid was unable to "lay his hand on so much as a dried skull, much less have the chance of making a dissection." Stories of this kind were current among the opponents of the newer anatomy; one of the telling examples given used to be the hypothetical case of a woman who might appear dead but actually be living and suffering from *suffocatio uteri*, an ancient form of hysterical stupor.

More authoritative and psychologically more coherent and creditable is the story of the renowned botanist Carolus Clusius, who in addition to being an accurate observer and collector of data was, like Vesalius, a Belgian. In 1565 he gathered and noted down certain reports then current both at the Court of Madrid and in Brussels, the birthplace of Vesalius and the place where Vesalius' wife went to live when she parted from him at the Spanish border. In 1607 Clusius wrote from his notes to the historian Tuanus, saying in substance that Vesalius had been unable to adapt himself to the life in Spain. He would readily have returned home (Brussels?) but the Emperor would not let him go. Vesalius became ill; he was very slow in recovering and repeatedly asked the Emperor for permission to leave; he even promised to make a pilgrimage to Jerusalem if permitted to go. At length the Emperor consented. In the month of April, 1564, Vesalius, his wife and baggage left Madrid. In Cette they parted; his wife went to Belgium, Vesalius to Venice. At the Court of Madrid Vesalius had borrowed money from some Belgian noblemen which he promised to pay back with

[6] Roth: *op. cit.*, p. 274.

high interest upon his return from Jerusalem. For two weeks, so Clusius continues, he stubbornly refused to pay some customs duties and remained at the Spanish border. In general, Vesalius had become very stingy. On his way from Jerusalem he had with him so little food that he was starving, although he would not admit it; a German nobleman is supposed to have noticed his plight and tried to help him, but Vesalius' strength had been greatly reduced and he died on the small island of Zante shortly after his ship dropped anchor there. He was buried by his fellow passengers. His widow, relates Clusius, very shortly afterward married a young nobleman by the name of Vandernoot.[7]

From the purely external point of view, this report by Clusius appears almost incredible. It is difficult to believe that Vesalius, after twenty years in the service of two emperors, should suddenly find himself so extremely poor that he had to borrow money at a usurer's rate of interest, that he was unable to pay the small customs fees only a few days after he had borrowed the money, and that he was in such poverty that he was reduced to hunger on his way back from Jerusalem and starved almost to the point of complete exhaustion. Vesalius' biographer Roth discredits the whole story and particularly the reference to Vesalius' avarice. How could one suspect the man of being stingy, he asks, if we recall how freely he spent in order to secure the best possible drawings for the *De Fabrica*. One might go further in one's doubts and, in addition to this query, say that if Vesalius were really stingy he certainly would not have found himself in bad financial straits after twenty years of good work and of being in the good graces of two emperors.

Yet, if our assumption that Vesalius was gradually reaching the terminal stage of a chronic depressive condition—which set in some time between 1543 and 1544, immediately after he had reached the very height of his creative ambition— is at all accepted, Clusius' report becomes not only credible but quite intelligible.

The final return to the intellectually stifling atmosphere of Madrid in 1559, the sudden and painful re-awakening of the memories of his days in Italy caused by the arrival of the book by Falloppius, only accentuated the depressive, ruminative state which had been lingering

[7] *Ibid.*, pp. 276, 7.

in Vesalius for so many years. As is characteristic of conditions of this type, they present a combination of a sense of personal failure with an unrealistic awareness that life is gone, opportunities have been missed never to recur, that one is old, inwardly and physically feeble, and helpless before fate. Under such circumstances, one does not fathom that what appears as fate is but a pattern of life chosen by the individual himself, who is the seeming victim of an allegedly external fate. Individuals burdened by such depressive conditions, particularly in the terminal stages, become even more withdrawn. They are capable of an impulsive flight from the life they happen to be leading—not back into creative life but further away from the world, into wasting hypochondriacal states and not infrequently into death. During this last stage, apparent exacerbation of activity is frequent. Individuals thus afflicted become extremely stingy no matter how affluent they may happen to be. They feel fully convinced that they are hopelessly poor, that they have not a penny to buy food; even when offered food they refuse to accept it and, when they do volunteer to give or are led to explain the reason for their refusal to accept food, they usually say either that they will never be able to pay for it or that they are not worthy and should not partake of food.

Separated as we are from the last days of Vesalius by three hundred and eighty years, we have no definite data as to the ideational content of his last two or three years of life, and therefore we cannot say what the psychodynamic terminal features of his inner conflict were. Also, it is doubtful whether much more could have been learned if Vesalius had not been separated from us by this great span of time. He was a schizoid person, and it has already been mentioned that little becomes known of the inner life of such individuals even if we live in close proximity to them. However, even on the basis of the few and indirect hints which have reached us about Vesalius, and on the basis of the total pattern of his life, we are justified in viewing him as a regrettable victim of his own inner pathological conflicts, which were intimately personal and strong enough to mutilate the genius which he possessed. Yet it is this very conflict and emotional handicap that made it possible for him to perform the great scientific revolution which he did perform, as if with a single blow, by a sort of meteoric effulgence.

It is extremely impressive to observe, and imperative not to overlook, that Vesalius—taciturn, melancholic, unpredictable, spiritually sick and morose—seems now to fit perfectly into the picture of the Renaissance in relation to the cultural and scientific conflicts with which it seethed. History, in all its multicolored contradictions and seeming disorderliness, always chooses the right man for the corresponding deed.

The Society of Jesus, for instance, was undoubtedly the personal creation of the indomitable will of the morose, austere, and rigid Ignatius Loyola. Yet it is difficult to imagine any other personality capable at that time of undertaking the re-assertion of absolute obedience to the Church, when her authority was crumbling and when both her dogma and her power were tottering under the impact of so many forces which were disintegrating the old and not yet fully capable of establishing the new on a solid, well-integrated basis. No one but Loyola, with his particular personality, would have been able to conceive of and to carry out this task. And no one but a man with the singular psychological characteristics of Vesalius would have been able at that time to rise above the fear of death and of the dead and to make both serve the understanding of the living, vital man. The very pathological nature of his infantile and adolescent drives, which was the cause of failure in his personal life, made it possible for him to serve the humanistic trends of the Renaissance and its scientific revolution, in a department which required not only special intellectual endowment but a special emotional predisposition. This predisposition was, then, pathological from the individual but not from the historical point of view.

It is tempting, of course, to try to elaborate further on certain psychological and historical perspectives in relation to Vesalius, and perhaps to draw certain speculative or positive conclusions about the relationships between the individual pathological elements and their utilization by historical forces for creative purposes. But the data transmitted to us thus far on this subject are still insufficient to warrant more definite considerations. One must desist for the present and await further study of Vesalius the man.

A PROPOS OF THE *FABRICA* OF VESALIUS *

W. M. IVINS, JR.

This paper is intended to raise questions rather than to provide answers to them. In its crucial part it is to be regarded as an expression of doubts about the validity of the inferences on which an imposing legend is based, and not as a series of affirmations as to what actually happened.

This year 1943 is the four hundredth anniversary of the publication of one of the most remarkable books that is known to the historians of medicine, the *Fabrica* of Vesalius. That book is also one of the most remarkable volumes that is known to the historian of book illustration. It needs to be looked at from both points of view.

Ten years ago, looking into some of the artistic problems connected with the illustrations in the *Fabrica*, I discovered that for practical purposes the study of Vesalius and his book had come to an end with the publication of Roth's remarkable essay (*Andreas Vesalius Bruxellensis*, von M. Roth, Berlin, Georg Reimer, 1892). It did not take me long to notice that " Roth " was the great repository of all Vesalian information and that practically everything in the subsequent literature was based on it. Roth was a most diligent and extraordinary collector of documents, who must have devoted many years of learned and untiring labor to his self-imposed task, but he was an ardent worshipper who knew nothing about the history of art or the history and psychological processes of illustration, and who uncritically twisted everything to the greater benefit of his hero.

I am told by high authority that little or nothing has been done on the Vesalian problems during the last ten years. It is surely full time that both " Roth " and the original Vesalian volumes were carefully examined by some properly trained medical person who is actually acquainted with the history and techniques of illustration, who knows something about the general state of anatomical knowl-

* The material substance of what follows was contained in a very informal spoken address made by the writer at a meeting of the Section for the History of Medicine of the New York Academy of Medicine, on January 13th, 1943. It is to be noted that the writer knows nothing about " anatomy " and bases none of his arguments upon it.

edge in the first half of the sixteenth century, and who has some sense for the probative values of evidence.

To begin at the logical starting point, which is not the same as the historical beginning, I assume that one of the basic requirements of any descriptive science is a method of making and distributing invariant pictorial statements of things observed. Without the ability to make precisely duplicable images it is impossible to carry a descriptive science very far.

The ancient Greeks carried two sciences very far: one mathematics, the other astronomy. Mathematics is a logical proceeding dealing with abstract entities. Its business can be conducted entirely with words and symbols. Astronomy has an invariant picture book which is available to all the world every clear night. The Greeks, in spite of their extremely great intelligence and high curiosity, failed to achieve comparable results in their other sciences because they had no way of making precisely duplicable records of their discoveries or of producing invariant pictorial definitions of their nomenclature.

There can be few sentences richer with meaning for the historian of thought than Socrates's remark in the Cratylus—"How realities are to be learned or discovered is perhaps too great a question for you or me to determine; but it is worth while to have reached even this conclusion, that they are to be learned and sought for, not from names but much better through themselves than through names." (Cratylus, Loeb Library, 439, B.) In other words: "Was gezeigt werden kann, kann nicht gesagt werden." A properly made picture is one of the best and most efficient ways of pointing.

Following this down we find in Book XXV of Pliny's *Natural History* the following statements about the Greek botanists. After forty years study of illustration and of the voluminous writings about it I recall no more illuminating sentences than these. I quote from the Bohn translation: (Chapter 4.) "In addition to these, there are some Greek writers who have treated of this subject, . . . Among these, Crateuas, Dionysius, and Metrodorus, adopted a very attractive method of description, though one which has done little more than prove the remarkable difficulties which attended it. It was their plan to delineate the various plants in colours, and then to add in writing a description of the properties which they possessed. Pic-

tures, however, are very apt to mislead, and more particularly where such a number of tints is required for the imitation of nature with any success; *in addition to which, the diversity of copyists from the original paintings, and their comparative degrees of skill, add very considerably to the chances of losing the necessary degree of resemblance to the originals. . . .*" (Italics mine.) (Chapter 5) "Hence it is that other writers have confined themselves to a verbal description of the plants; indeed some of them have not so much as described them even, but have contented themselves for the most part with a bare recital of their names, considering it sufficient if they pointed out their virtues and properties to such as might feel inclined to make further inquiries into the subject." (Chapter 10) "The plant known as 'paeonia' is the most ancient of them all. It still retains the name of him who was the first to discover it, being known also as the 'pentorobus' by some, and the 'glycyside' by others; indeed, this is one of the great difficulties attendant on forming an accurate knowledge of plants, that the same object has different names in different districts."

What was true of the Greek botanists was true of all other descriptive scientists until the invention and pervasion of the graphic processes of making printed, i. e. precisely duplicable, images, which came about in the fifteenth and sixteenth centuries. The making of pictorial woodcuts began in Europe roughly about 1400 A. D. as a labor saving device for the more rapid turning out of talismans and sacred images. In the beginning what was thought about was the quantitative capacity of the new process. It took a long while for people to realize the practical meaning of the fact that the process made it possible to repeat endlessly the same identical pictorial statements about forms.

The first printed botany book to contain illustrations was the Pseudo-Apuleius, which was printed at Rome shortly after 1480 (Hain 1322). The text and the illustrations of this remarkable book are copies of a late classical manuscript, the illustrations in which had degenerated through a number of centuries of repeated copying. The result was that in the Roman book the pictures of the plants and flowers had lost all representational value. So far as I am aware no one has written on the psychological processes of the

copyist. It is a subject, however, that deserves the most careful thought that historians of thought can give it. The copyist in copying a picture of something that he has not seen is unable to determine whether wiggles in lines are due to the nervousness or other incapacity of the original draughtsman or actually represent characteristics of the object represented. When faced by this problem the copyist solves it by applying reason, that curious thing you apply when you don't know. The result of this in the case of the Pseudo-Apuleius is that all the plants and flowers have been most reasonably turned into members of the well known botanical family of Jewish ceremonial candle sticks.

Shortly after the publication at Rome of the Pseudo-Apuleius there was printed at Mainz, in 1484, a book known under many names but generally recognizable as the Latin *Herbarius* of that year (Hain-Copinger 8444). It is said that the majority of the authorities quoted in its text wrote before 1300 A. D., and that no author is mentioned who might not have been known to a student in the middle of the fourteenth century, that is to say, at least a hundred years before the Herbarius was printed. A few of the woodcut illustrations in this book would seem to indicate that at some time or other their draughtsman had seen a real plant. The next year, 1485, there was published, also at Mainz, a German herbal known as the *Gart der Gesundheit* (Hain 8948), in which many of the woodcut illustrations were drawn sensitively from nature and on a large scale. These may be regarded as for practical purposes the first series of precisely duplicable images made with what today would be called scientific intent.

The generation of botanists and botanical illustrators who followed these two herbals of 1484 and 1485 almost without exception reverted to the old traditional ways, and instead of going out into the fields and making pictures of what they found and saw contented themselves with copying pictures that had already been made. They applied reasonability to the brute irrational characteristics of the plants and they adapted their shapes to the spaces that were to be filled on the pages of the books. It did not take long for the pictures to become mere decorations instead of conveyors of information.

The next real step was taken with the publication in 1530 of Brunfels's Herbal, which was illustrated by the well known draughtsman Hans Weiditz. One of the ablest illustrators of his time, and incidentally one of the most charming, Weiditz went perhaps too far in his naturalism and produced drawings which were rather portraits of particular individual plants than statements about the distinguishing characteristics of species, even showing broken stems and petals and other minor accidents of growth. In 1542 there was published Fuchs's Herbal in which there was achieved one of the best compromises that has yet been made between the portraiture of an individual plant and the generalized statement of the characteristics of a species. Even today the " Brunfels " and the " Fuchs " serve as the models for many of the best illustrated botanical books. In one curious way they differ profoundly from the *Fabrica* of Vesalius. Brunfels included in the prefatory matter to his Latin edition a poem lauding his illustrator Hans Weiditz. Fuchs, at the end of his book, inserted portraits of his two draughtsmen and of his woodcutter. The Fabrica is completely silent as to both draughtsman and woodcutter.

The history of printed anatomical illustration is somewhat different from that of printed botanical illustration. Although printed anatomical illustration was much slower in getting under way, its great classical expression was reached in the Vesalian *Fabrica* printed in 1543, the year after the publication of the Fuchs herbal. If that expression had not been in the *Fabrica* of Vesalius, it would have been in another book by another man within a very short time, for the process of illustration was at last available and the world wanted a pictorial account of anatomy. It was definite pictures that the world wanted and not conversation in a vocabulary of undefined and shifting meanings.

It is probable that the first attempt at anything more than a mere schematic, organization-chart, representation of anatomical facts is to be found in the Venetian Ketham of 1493 (Essling 586). The Venetian Ketham of 1491 (Essling 585) was still illustrated with wholly abstract organization charts. The first serious pictorial attempt to represent anatomical facts is probably to be found in the Vesalian *Tabulae Sex* of 1538, which was published at the cost

("sumptibus") of John Stephen of Calcar, as is testified by its colophon. The first three of these large woodcuts were mere organization charts, which may have been drawn by Vesalius. The second three were skeletons, which the short text says were drawn by John Stephen. These woodcuts of skeletons were the first attempt veraciously to depict anatomical facts in a medium which permitted of precise duplication. The value and the great novelty of the *Tabulae Sex* appear to have been in these Skeletons (Roth pp. 90, 91). Full size facsimiles of the six woodcuts are to be found in *Andreae Vesalii Icones Anatomicae*, published by the New York Academy of Medicine in 1934. The success of the *Tabulae Sex* was immediate, as is proved by the existence of several contemporary forgeries issued north of the Alps. Perhaps the best of these piracies was that issued at Augsburg by Jobst de Necker, the well known Netherlands woodcutter.

This brings us immediately to Vesalius and John Stephen of Calcar.

Vesalius appears to have been born in either 1514 or 1515 at Brussels (Roth p. 58). He was educated at Louvain (Roth p. 61 ff.), and upon leaving there went to Paris, where he studied under Sylvius, one of the great leaders of the reigning Galenical school of medicine (Roth p. 64), attended the public anatomies and independently dissected dogs and studied human bones (Roth p. 68), the latter of which were available to him in quantity in the cemetery of the Innocents (Roth p. 69). After three years at Paris, Vesalius, in 1536, returned to Louvain (Roth p. 72 f.), where in 1537 he published a commentary on one of the books of Rhazes. In 1537, aged at most twenty-three, he went to Italy, where in December of that same year he took his doctor's degree at Padua and was appointed professor there (Roth p. 78). He seems immediately to have begun an active career of writing, lecturing, and dissecting. In 1538, aged at most twenty-four, he wrote several paragraphs of text for the *Tabulae Sex*, and possibly designed its three schematic woodcuts of *Viscera*. A little later in that same year, 1538, Vesalius published an edition of Guenther's *Institutiones Anatomicae*, in which apparently his principal claim was to have freed the text from the proof-reading errors that existed in the previous edition (Roth p.

93). So modest a claim by a man not given to modesty is perhaps to be taken at its face value and not waved aside.

In 1539, aged at most twenty-five, he published his *Epistola Docens* (familiarly referred to in the German literature as the "Aderlassbrief"). According to Roth, "Die Schrift ist eben eine Jugendarbeit" (Roth p. 97), and "wurde nicht mit Thatsachen, sondern mit Zitaten entschieden" (Roth p. 96). In many ways the most interesting things in the *Epistola Docens*,—at least from the point of view of this particular examination,—are, one, a clumsy schematic woodcut, and, two, a reference to John Stephen in which Vesalius says: "Quamobrem si corporum dabitur opportunitas, et suam operam Joannes Stephanus insignis nostrae aetatis pictor non denegaverit, nequaquam ego eum laborem subterfugero" (Roth p. 173). This sentence is of peculiar interest and should be read with great care, for it predicates that the big task of the future is to be based on a supply of bodies and on the continuing skill of John Stephen, and that given those two things Vesalius will not evade his own part in the undertaking. It comes very closely to being a statement by Vesalius that his own work is going to be based on that of John Stephen.

In this same year, 1539, Vesalius's professorship was renewed and he was granted an increase of salary (Roth p. 428). Otherwise Vesalius's activities during the years just preceding 1542 are known to us only through his own statements. According to his own account (Roth pp. 86, 117, etc.) Vesalius during this time made two trips to Bologna, where he performed public anatomies, began and finished the task of editing three of Galen's texts for the great Venetian publisher Giunta, read Avicenna with Lazarus Hebraeus and compared the text with Hebrew manuscripts, wrote a careful paraphrase of all ten books of Rhazes, collected the recipes of the classical authors, and conceived ideas for a number of other books. In addition to these mere parerga he carried on his professional task of lecturing and dissecting, and incidentally some time in 1540 (Roth pp. 112, 114) began to write the text for the seven hundred page *Fabrica* which was finished in August 1542. The *Fabrica*, it is to be remembered, was no mere compilation or swapping about of learned texts, but a bombshell of revolutionary knowledge acquired the hard way of observation in

the operating room. It is quite a job to write such a text for the first time in history.

According to Roth (p. 109) it seems that as late as January 1, 1539, Vesalius did not know how defective Galen's teaching was, and that (Roth p. 112) it was not until after he had begun his editorial labors on the Giunta Galen in 1540 that he realized for the first time that Galen had never dissected a human body. According to Vesalius's own accounts he had not only been a student since his early youth, and had studied in the Galenical school at Paris, but he had performed many dissections on bodies, or parts of them, which he had acquired in many ways, both official and illegal and adventurous (Roth p. 108). He had spent three years at Paris where the cemetery and charnel houses of the Innocents were open to all the world and where human bones were piled up for all to see (Roth pp. 68, 69). Three times he had lectured on Galen, once as early as 1537 (Roth p. 112). It is difficult to reconcile these facts with Vesalius's so late discovery about Galen, except on the theory that perhaps Vesalius did not actually know as much as he said he did. In any event one would think, as a layman in complete ignorance of these arcana, that the breast bone would be one of the most familiar of bones to any frequenter of the Innocents and climber of gibbets, and that any in the least inquisitive medical man with this experience would have know that it was not composed of seven pieces as Galen said it was and as it was represented in John Stephen's woodcut of a skeleton in the *Tabulae Sex*. Had Vesalius known the fact, he would surely, being Vesalius, have corrected John Stephen,—but he did not correct him, he said that everything in the woodcuts was just as he had demonstrated it to his students at Padua (Roth p. 90). This business of the breast bone seems to be only one of many similar Galenical errors in the *Tabulae Sex*. There is much that has to be explained about all this kind of thing.

In 1541 the Giunta edition of Galen was published with Vesalius's notes and commentary upon his allotted books. It is to be noted that up to this time, except for whatever went into the *Tabulae Sex*, Vesalius had published no book of original research, his contributions apparently having been the traditional learned pitting of text against text, the compiling of footnotes, and the editorial correction

of other men's texts. The few woodcuts in the *Tabulae Sex* and the *Epistola Docens* which have been attributed to him are mere diagrams without representational value. However, on the twelfth of August 1542 Vesalius's professorship at the University of Padua was again renewed and his salary raised to the handsome figure of two hundred florins (Roth pp. 126, 430). On the first day of that same month of August he had finished the text of the *Fabrica*, and on the thirteenth he was to finish the text of the *Epitome* (Roth p. 126).

This is surely one of the most amazing and miraculous histories in the history of science. A youth can go far and fast in a logical investigation, as witness Galois, Abel, B. Russell, and Einstein, but it would seem to be impossible to hasten the slow process of investigation and the laborious accumulation of empirical data involved in such a task as the exploratory study of anatomy. This is especially true when we consider the state of published anatomical information at the time when Vesalius worked and the conditions under which dissection had to be done. There were few specimens officially available, there were no preservatives and no ice boxes, and neither were there any accumulated pictorial records of other men's work. What we know about Vesalius's dissections we know only from his own *ex parte* and far from generous or modest statements. There appear to be few or no contemporary records or eye witness accounts of Vesalius's performances. His apparent lack of friends and the large number of men who seem to have disliked him thoroughly have also to be borne in mind. Most great teachers and investigators have had a curious generosity and a way of forming about them most loyal groups of pupils and admirers.

Towards the end of the month of August, 1542, in which Vesalius had finished his manuscripts of the *Fabrica* and the *Epitome*, he packed them up, with the blocks and proofs from them, and shipped them to the printer Oporinus at Basle (Roth p. 127). Any theory that this was done to avoid charges of heresy will not hold water unless new facts are adduced in support of it. Venice was still at that time the greatest printing and publishing center in the world, and there also there was generally speaking a greater freedom of expression and thought than anywhere else in Europe. The Holy

Office did not begin to hold trials for press offenses in Venice until 1547 (H. F. Brown, *The Venetian Printing Press*, London, 1891, p. 110), and Las Casa's catalogue of prohibited books was not printed until 1548 or 1549 (*ib.* p. 125). The fact that Vesalius had printed his big book did not prevent his becoming surgeon to the Emperor, and neither did that prevent his getting out a second edition in the 1550's. The Emperor was Charles V, a monarch whose attitude towards orthodoxy and heresy needs no support of learned citation. No adequate reason has been adduced for sending the book over the mountains to a foreign country to be printed and published. It is conceivably to be tied up in some way with the facts that neither the *Fabrica* nor the *Epitome* mentions the name of John Stephen who illustrated them, and who illustrated and paid for the printing of the *Tabulae Sex*, and that in the *China Root* of 1546 Vesalius was to tell about how he had quarrelled with the artists.

It is interesting to notice that after the unexplained shipment of the manuscripts and blocks to Basle in August, 1542, we begin to lose track of Vesalius's whereabouts and activities. Roth has no data in regard to the period from August, 1542, until early in 1543, when Vesalius appears in Basle (Roth pp. 127, 128). He was in Basle in August, 1543 (Roth p. 129). Roth says (pp. 180, 181) that Vesalius at an unknown time late in 1543 returned to Padua and resumed his teaching and dissections there. This is based upon two petitions made to the authorities of the university of Padua in October, 1543, one (Roth p. 431), for the payment of his salary during his absence or furlough,—but the document says nothing about Vesalius's whereabouts and apparently was not signed by him,—and another (Roth pp. 431, 432) in regard to some public anatomies to be held. The meaning of this second petition is far from clear, but it would seem to indicate that Vesalius was then in Padua asking that he might be allowed to conduct some anatomies in order to check up and perfect his recently published book. It tells of the popular success of his clinical lectures, if public anatomies can be so described. Whether or not the permission was given, I, in my ignorance, cannot determine from the official record as printed by Roth, but in the *China Root* of 1546 Vesalius tells us that he dissected two bodies during his last visit to Padua. In any event he

would appear to have been in Padua only a short time and very soon to have been on his travels again, visiting both Pisa and Bologna early in 1544 (Roth p. 187). Neither the details of this short second visit in Italy nor the documents invoked seem very explicit. After it there is no evidence that Vesalius was ever in Venetian territory again until 1564, the year of his death and long after the death of John Stephen. In any event his career as a writer came to a practical end when he left Padua in the summer of 1542 at the age of twenty-eight, and his career as an investigator apparently stopped at the same time, i. e., just at the time, it may be thought, that his relations with John Stephen terminated.

What all this means is that little led up to the *Fabrica* and nothing came after it. During the time in which the *Fabrica* must have been written its author was so busy and burdened with many other things that it is difficult to see how he found the time and energy to do the work that led up to the writing of the *Fabrica* and then the writing itself,—except on the theory that it was in largest measure a running commentary or explanation of work already done by someone else. If Vesalius had been really a great investigating scientist and had had the burning desire to advance knowledge with which he is credited, the complete lack of creative work before and after the *Fabrica*, which was done in collaboration with John Stephen, and the long silence from the age of thirty-two (i. e. when he published the *China Root*) to that of fifty (i. e. when he published the *Observations on Falloppius* and died), need a vast deal of explanation.

After the publication of the *Fabrica* and the *Epitome* at Basle in 1543 Vesalius appears to have issued a second edition of the *Fabrica* in the middle 1550's and otherwise to have written but two small books. The first of these, printed in 1546, is known as the *China Root*. If I understand Roth correctly it is not so much a medical treatise as an autobiography and ill-tempered "apologia," in which he describes himself as the Emperor's doctor, tells of his misunderstandings with the artists, calls Realdo Colombo, his successor at Padua, a pretty assortment of names, and says that he had never seen an Italian do a dissection (Roth pp. 215, 172, 182, 183). The second edition of the *Fabrica*, the printing of which may have begun as early as 1552 (Roth p. 224), contains amendments and changes,

but it is also remarkable for the fact that much of the credit given to others in the first edition is removed (Roth p. 231). *Dorénavant il n'y aurait qu'un dieu dans les cieux.* Vesalius's final publication was the *Observations on Falloppius,* which was issued in 1564 immediately after the deaths of both writers. Cast in the form of a letter this last is extremely interesting for two things in particular, one, that Vesalius took no stock in many of Falloppius's very important and most original observations and did not bother to control them by a little poking about in a cadavar, and, two, that in rejecting them he held to the old erroneous Galenical teaching (Roth p. 266). A great deal of this book would seem to be devoted to rather skillful exercises in that boasting, carping, and unrestrained calling of names which is sometimes cynically included among the amenities of learning.

It is to be noted that practically everything we know about Vesalius, his accomplishments, his desires, his learning, his contributions to knowledge, his personal history, is contained in the complaining, boasting, *ex parte* statements that he made himself, and which in so many instances bear every mark of the utterance of a man suffering from a highly developed "inferiority complex." It is especially to be noted that the name of John Stephen appears only three times in the Vesalian books, once in the text of the *Tabulae Sex*, once in its colophon, and once in the *Epistola Docens.* There is no reference to him by name in anything after the *Epistola,*—although in the *China Root* there is an angry, slighting, reference to the troubles that Vesalius had with the artists and the way in which they treated him.

Let us now look at the illustrator, John Stephen of Calcar. Here unfortunately we seem to face a very great lack of explicit information. Most of what we have is to be found in the pages of Vasari and von Mander. From these it appears that he was a Fleming. He must have been in Italy for some time before Vesalius arrived there. The books throw no light on the date of his arrival, but no evidence is needed for this last statement beyond the simple fact that by the time he had made the first of the drawings that came out in the *Fabrica* he had been able to absorb completely the three-dimensional draughtsmanship of Titian and his school. Our eyes

tell us that few if any other northerners ever succeeded in doing this, and in his own time it was remarked upon by Vasari who said " le sue opera non erano conosciute per mano di fiammingo." (*Vite*, 1568, III, p. 858). No such mastery of a foreign idiom is quickly or easily acquired. Vasari tells us specifically that he knew John Stephen at Naples in 1545, that he was a pupil of Titian, that he drew the figures for the anatomy of Vesalius, and that he died young (ib. pp. 818, 858). John Stephen's master was Titian, whose master was a Bellini, who was the son and nephew of two other Bellinis and the pupil of Mantegna, who was the pupil of Squarcione. It would be difficult to find a more extraordinary heritage of intelligence and accomplishment than that which is thus indicated, or one more marked for the way in which it broke away from tradition and discovered new fields of thought and action. Vesalius's background was far from being of this kind or intellectual quality. Even if we take Vesalius at his own high estimate, the revolution that he brought about is not comparable to that which these painters brought about. In many more respects than anyone is usually aware of we still see in terms laid down by them,—whereas the specific Vesalian contribution to knowledge has for centuries been dead.

It is today common knowledge, whatever it may have been in the Basle of fifty years ago when Roth was writing, that the Italian artists for a long time before the middle of the sixteenth century had been busily studying anatomy for their own reasons and in their own ways, many of the latter being highly illicit but nonetheless effectual. Leonardo's anatomical drawings are today known to all the world through countless reproductions of his drawings. Michael Angelo was known in his time for his anatomical investigations. And the same thing is true of others, as for example Pollaiuolo. Roth either did not know of this work of the artists or else he deliberately shut his eyes to it. The only mention of Leonardo in Roth's book is contained in a footnote on page 49, in which he says that although Leonardo made many anatomical drawings the two hundred photographs of such drawings cited by Haeser were not " zugänglich " to him, and that therefore he refrains from expressing an opinion about them. Roth's one reference to Michael Angelo is on pages 10 and 11, where in a footnote he cites Condivi's life of

Michael Angelo for the fact that when Michael Angelo was working on the figure of the Christ for a crucifix for the convent of S. Spirito the abbot sent him some bodies to help him in his work. Roth neither quotes nor calls attention to the other passages in Condivi's short book in which it is told about Michael Angelo's studies of anatomy and his dissections, and of the plan that Michael Angelo and Realdo Colombo had for co-operation in a work on the subject.

Closing his eyes to all these things Roth maintains that Vesalius deserves all the credit for the drawings for the *Fabrica* and belittles John Stephen's part in them. To check and criticize the maze of fact, misrepresentation, inference good and bad, and pure guess work, on Roth's pages 169 to 180 would require a treatise of considerable length and intolerable boringness,—and in the event would not be worth doing, for the basic facts are plain and need no ingenuity or contortion. Actually the only evidence we have about Vesalius's ability as a draughtsman is contained in his own statements and in the four dull schematic woodcuts, three in the *Tabulae Sex* and one in the *Epistola Docens*, that can possibly be attributed to him. No artist's statements, nor those of any other man who draws, about his own ability as a draughtsman have any evidential value as to the quality of his drawings. The only things that speak authoritatively are his actual drawings. It needs no great or specialized knowledge to be certain that whoever made the four drawings just mentioned was not the man who illustrated the *Fabrica* and the *Epitome*. Moreover, no northern youth who had been in Italy only six years busily spent in performing anatomies, lecturing, writing, editing, and travelling, could in his off time have learned to draw as did the illustrator of the *Fabrica*. Such a thing can only be thought possible by one completely ignorant of the psychology and the practice and difficulties of draughtsmanship.

Roth's insistence upon the great part played by Vesalius in the making of the illustrations, and, as he sees it, the minor part played by John Stephen, was forced upon him by his recognition of the logical implications of three things: (1) The first of these was that the text of the *Fabrica* is no more than a commentary on the illustrations and is based on them throughout. On page 167 Roth speaks of the " Niederschreiben des (*durchaus auf den Figuren fussenden*)

Textes" (Italics mine), and says it could not have been begun until after most of the illustrations had been prepared. Having made this statement of the way the *Fabrica* was written Roth had either to claim the merit of the drawings for Vesalius or admit that Vesalius played second string to John Stephen. The importance of the illustrations is emphasized by the way in which they are peppered over with letters of the alphabet referring to the "Indices characterorum,"—which is to say that Vesalius's words received their definitions from the pictures, and that without the pictures Vesalius could not have spoken intelligibly about his subject matter. (2) The second thing was that the illustrations are the great basic thing in the *Fabrica* and not the text. On page 155 Roth says "Die ganze Arbeit Vesals wäre verloren gewesen wenn er nicht seine Ergebnisse durch Bilder festgehalten und verdeutlicht hätte. *In den Figuren liegt die zünende Kraft seiner Anatomie.*" (Italics mine.) Having made this statement Roth again had either to claim the credit of the drawings for Vesalius or admit that Vesalius's text was little more than an accompaniment to John Stephen's solo. (3) The third thing was that if the drawings had been made by John Stephen, John Stephen would have had to know as much anatomy as Vesalius himself,—which, for Roth, was preposterous. Roth on page 174 says "Dass ein Künstler so viel Anatomie verstand um Idee und Entwicklung der Kompositionen finden zu können, ist wenig glaublich. *Er hatte so viel Anatomie wissen mussen als Vesal selbst.*" (Italics mine.) This is merely a statement that as the draughtsman had to know as much as Vesalius he therefore could only have been Vesalius,— because no mere artist could have known as much as that. The attribution of the drawings to Vesalius under the circumstances and on these grounds is the kind of miracle invoked by hero worshippers and pious theologians when facts get in the way of faith. The elder Gosse would not believe in the recession of the waters, and maintained that God had put the sea shells on the mountain tops to prove the faith of men. The acuity of Roth's arguments in general is summed up in his remark (p. 176) that Vesalius must have been an accomplished draughtsman because he helped a Basle printer to select his printer's mark,—an argument that would have remarkable consequences if applied in the same way to a shopping trip by Mrs. Smith and Mrs. Jones.

Entirely aside from their scientific content, the finished woodcuts in the *Fabrica* and *Epitome* are among the great landmarks in the history both of the woodcut and of book illustration. In the absence of early proof impressions the woodcuts must be seen not in the old books but in the wonderful reprint published in 1934 by The New York Academy of Medicine from the original blocks. Only in this modern volume can these woodcuts be properly seen and appreciated as drawings. Their precision and clarity of statement and the extraordinary way in which the third-dimensional qualities of the subjects were brought out were epoch making and such that many of these woodcuts are still models of representational draughtsmanship.

Drawings of this kind are not made casually and quickly. They can only be made by men long trained and extremely skillful. They can only be made slowly and step by step, and they have to be carried through from beginning to end by one hand. Especially was this true in the days before there was any professionalized practice of anatomical drawing and when there was no accumulation of precedents to be followed or information to be utilized. There had to be the initial rough hasty drawings made in the operating room of each separate part of the body; then these primary drawings had to be carefully untangled and worked out into clear statements, which we may call the secondary drawings; after this was done the information contained in the secondary drawings, which were made on various occasions, had to be correlated and brought together in synthetic tertiary drawings, which by the mere nature of the process were full of trials and errors (pentimenti); and from these the final drawings, whether directly on the blocks or on paper to be pasted down on the blocks, were made slowly, carefully, clearly, and in a highly stylized manner. To think that so many drawings of this character, of subjects which had never before been represented in print, could have been made in the short time allotted by Roth seems highly improbable.

If to these difficulties there are added those involved in taking the information gathered from many rapidly decaying, soft, drooping, anatomical specimens on operating tables and bringing it together in the woodcuts of the famous "musclemen" *in which the whole body is poised and in action*, we have to take still another thought.

The same thing is true of the standing and moving skeletons,—for when Vesalius mounted a skeleton he mounted it stiff and unmoving except for the lower jaw and the moveable top of the head (Roth pp. 170, 465). To make transmogrifications of this kind lies beyond the power of any draughtsman brought in *ad hoc* and set to making composite synthetic drawings from the odd pieces he sees laid out before him on another man's operating table. Moreover, how to pull things together in this way cannot be explained to any ignorant draughtsman by another man in such a way that it becomes possible for the draughtsman to do it. The only practical way to criticize a factual drawing, which is intended to be something more than a bare organization chart, in such a way that it may be remade correctly, is for it to be "corrected" in drawing by a man who knows the facts and who can draw at least as well as the maker of the drawing. Criticism by word of mouth is only practical when the draughtsman knows all about the subject matter of the drawing, and but rarely even then. Drawings like this represent synthesis of a very remarkable kind that can only be accomplished out of deep and familiar knowledge of the operational aspects of the mechanism that is represented. The man who reconstitutes a machine tool in a synthetic drawing made from sketches of its various parts, has to know how the completed tool looks and works and what it does. In the most literal sense the man who made these drawings for the books that go by Vesalius's name had to know as much anatomy as Vesalius did and in all probability a great deal more. That he was an old hand at the business is oddly proved by his very introduction of Galenical errors and animal forms, for these are things that the anatomically untrained man called in to sketch anatomical pieces could not know. The same errors, or others like them, are to be found in the drawings by Leonardo.

As we look back over the matters that have been discussed may we not be justified in thinking that perhaps the more mature John Stephen, who had paid the costs of printing and publishing the *Tabulae Sex*, was the real entrepreneur of the *Fabrica* and the *Epitome*, and that Vesalius's part—(remember the passage from the *Epistola Docens* quoted above from Roth's page 173)—was merely that of the young medical man who was handy with his pen and

who was engaged to write the commentary to accompany the drawings that John Stephen had made out of his own long years of industrious investigation? Vesalius's youth; his sudden disappearance from Venice and Padua in 1542 with the manuscripts and the blocks; the publication far away from Venice, the great center of the publishing trade; the failure to give John Stephen any credit for the drawings; Vesalius's very short second stay in Italy and his abandonment of the great position of the Paduan professorship to which he had been reappointed with a notable increase in salary; his abstention from all new scientific publication after he left Padua; his final so curious Galenical attack on Falloppius:—all these things raise questions which come down eventually to the very simple single question; Was not the real hero of the *Fabrica* John Stephen? The fact that the New York Academy of Medicine, in all innocence of any suspicion that there could be such a question, thought it worth while to produce its wonderful restrikes of John Stephen's blocks, but did not think it worth while to reprint or translate Vesalius's text has certainly some bearing upon the answer to that question. It was an evaluation made without prejudice or parti pris and represents the actual historical verdict of the last four hundred years.

In any event, whatever the answer to this question may be, it is certain that it is full time some serious work was done on the Vesalian questions and that they be cleaned from their fog of myth and blind hero worship. The *Fabrica* should no longer be looked at simply as an incident in the restricted history of anatomy. It should be examined from the point of view of an epoch making event in the history of the techniques for the recording and conveyance of information and therefore of its absolutely basic importance in the general history of thought. This cannot be done without a thorough understanding and appreciation of the contribution made to it by John Stephen of Calcar.

VESALIUS AS A CLINICIAN *

CHARLES DONALD O'MALLEY
AND
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The fame of Vesalius rests securely upon his achievements as an anatomist. The modern, with that too ready facility of interpreting the past in the light of the present, is, therefore, apt to look upon his endeavours as those of a specialist in a limited field, forgetful that the tradition of the Renaissance was the universal outlook. It may therefore be of value to examine briefly the clinical opinions and the practice of Vesalius in order to round the picture of the man and to maintain the essential perspective. Indeed so great has been the emphasis on his anatomical discoveries that there is a tendency to abstract the man from his intellectual difficulties and environment and thus to accept his contribution as some Promethean gift.

The sixteenth century was a lusty and tempestuous age, not to be judged by the standards of our own. Its authors, outspoken and often naive, flushed with the consciousness of their new discoveries, saw all in black and white and scarce could perceive in the new light, the pattern of their philosophical heritage. And thus the Vesalian criticisms of the Galenical anatomy take on the colour of his brash century for here, although his observations contradict, his thoughts accept the ancient doctrine. Nowhere more clearly than in his clinical approach do we see how strong were the very bonds which he sought to break, which fact serves to remind us, how slow and arduous was the transition to the modern scientific method.

Problems of the clinic and practical therapeutics early occupied Vesalius's mind, and his first youthful work, a recension on the ninth book of the treatise of Rhazes dedicated to the Caliph Almansor, *De singularum corporis partium affectuum curatione*, 1537, indicates this interest. The topic was no doubt inspired by family

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tradition, for his grandfather, Everard, had written a commentary on this popular compendium of therapeutics.[1] Indeed Vesalius contemplated the issuance of a complete paraphrase on all ten books of the Almansor as well as a book on medical formulae, for these, he tells us, were among the works which he destroyed in a fit of anger on hearing of the spiteful attacks made by his erstwhile friends and colleagues on the *Fabrica* at its publication.[2] However, Vesalius's clinical experience at this time must have been small, but soon afterwards, prior to his graduation in December 1537 at Padua, he left Brussels for Venice to put in several months of clinical study.[3] Clinical instruction was not undertaken in the hospitals of Europe until about the year 1543 when the method was introduced at the Hospital of St. Francis at Padua by Giovanni Battista Da Monte [Montanus, c. 1489-1551], a colleague of Vesalius in the medical school of that city.[4] Prior to that date the medical student could acquire practical experience only when permitted to accompany some physician on his rounds. This practice of visiting the sick with instructors is referred to by Vesalius on several occasions.[5] Reinerus Solenander [1544-1601], for many years personal physician to the Duke of Cleves, and who studied under Montanus, informs us in the preface to the *Consiliorum medicinalium*, 1596, that Italy was noted for this method of instruction which he praises very highly.[6]

Two years later, in 1539, Vesalius published his *Letter on venesection* in which he treats of the place of phlebotomy in the treatment of pleurisy. Although a minor work, the letter is of great importance in his development and emancipation from the authority of the Galenical anatomy. At the time of its writing there was no more contentious subject than that of venesection, and the whole of Europe

[1] *Andreae Vesalii Bruxellensis . . . epistola, rationem modumque Propinandi radicis Chynae decocti . . .* (Basileae [Oporinus, 1546]), p. 196. Hereafter cited as *Epistola Chynae.*

[2] *Ibidem*, p. 194-5.

[3] *Ibidem*, p. 12.

[4] Cf. Cervetto, *Giambattista da Monte* (Verona, 1839).

[5] *Epistola docens venam. . . . secandam . . .* (Basileae [Winter, 1539]), p. 55, hereafter cited as *VS*; Epistola Chynae, p. 12.

[6] *. . . sed de aegrotis confabulationes quaedam, quales qui Italiam vidit, novit morem hunc laudatissimum, quo sane cunctas alias nationes in studio medico antecedit.*

was split into two camps. The contemporary literature burgeoned into one vast and futile polemic, and there was scarcely a medical writer of any significance who did not participate. The controversy had been precipitated by Brissot [1478-1522], a physician of Paris, who attempted to re-introduce the Hippocratic and Galenical rationale of venesection in the treatment of this disease but who met with the vigorous opposition of those who clung to traditional practice. This famous controversy is often regarded as dividing Arabist from humanist, but this is not altogether so, for many of the most ardent humanists could see no contradictions between current practice and the teaching of the classics from which they laboured so earnestly to clear the Arabic rubbish. The fundamental issue was one of textual interpretation, and all the familiar tools of scholastic criticism were brought to bear. No matter how futile and barren the dispute may have been nonetheless, in a day when phlebotomy was the sheet anchor of therapeutics, the problem was a very real one to a physician genuinely interested in the welfare of his patient.[7]

Vesalius participated in the controversy on the side of Brissot. His approach is characteristic of his simple genius and his intellectual limitations. Like all those who preceded him, he accepts in its entirety the sterile theory on which the therapeutic doctrine rests. He can produce no clinical experience from which a better understanding of the disease may be obtained. Although the general tenor of his work indicates a growing reluctance to accept information not based upon personal observation, yet he quite frankly says, "As you know, I can offer no experience in corroboration of the present topic, since in my time, the few so far attacked by this disease, I have visited only with instructors." [8] He is unique, however, in that he seeks to establish his interpretation of the therapeutic applications of venesection on the secure basis of personal observation of the cadaver. Consequently he observes, as a first primitive step toward the definition of a scientific philosophy, that perhaps "the method of an anatomy" can corroborate speculation.[9]

[7] For the details of this controversy cf. K. Sprengel, *Histoire de la médecine, tr. de l'allemand* (Paris, 1815 ff.), vol. III; also the forthcoming translation of Vesalius's letter with introduction and notes by Saunders and O'Malley.

[8] VS., p. 55.

[9] *Ibidem*, p. 61.

Once the theoretical doctrine is accepted the whole logic of the precise technique of venesection to be employed in the treatment of pleurisy depends upon an exact knowledge of the arrangement of the veins within the thorax. For this knowledge every physician depended upon the authoritative pronouncements of Galen, but Galen's description of the venous system is by far the most unsatisfactory section of his anatomy. As early as 1536 Vesalius had observed in his edition of Guinter of Andernach's *Institutiones anatomicae* that his findings on the arrangement of the vena azygos had created doubts in his mind as to the correctness of the Galenical description.[10] Again he briefly draws attention to this obscurity in the *Tabulae anatomicae* of 1538.[11] At this time, however, Vesalius's anatomy is completely dominated by Galen, and his anatomical plates, great advance in the art of anatomical illustration though they be, show every evidence of that ancient hand.

With the writing of the *Venesection letter* of 1539 Vesalius is prepared for the first time to challenge openly Galenical authority, an assault which is twofold, on his anatomy and on his logic. The moment was of peculiar significance, for Vesalius was, as he tells us in the final pages of this letter, about to embark upon the preparation of the Fabrica.[12] A purely clinical problem by exposing the weakest link of the Galenical anatomy seems to have provided Vesalius with the necessary insight which enabled him to break with what he calls " the imposture of the Greek " and opened the vista of a redescription of the human body which he was to pursue with such feverish energy for the next four years to the completion of the *Fabrica*.

The *Venesection letter* is characteristic of his attempt to apply his academically acquired anatomical knowledge to practical considerations of the healing art. His growing knowledge of anatomy enabled him to oppose current opinion in the treatment of pleurisy and allied illnesses, while he supported with his faith what he believed

[10] *Institutionum anatomicarum secundum Galeni sententiam ad candidatos medicinae libri quatuor . . . Ab A. Wesalio . . .* Redditi ([Wittenberg], 1585).

[11] [*Tabulae sex* (Venetiis, 1538)]. Cf. *Des Andreas Vesalius sechs anatomische tafeln vom Jahre 1538 in Lichtdruck*, ed. M. Holl and K. Sudhoff (Leipzig, 1920), tab. 2, B.

[12] *VS.*, p. 65.

to be the true Hippocratic rationale of therapy without perceiving where the greatness of Hippocrates lay. And so while he could feel comforted that the Father of Medicine was on his side, actually it was the logic of his own anatomy which constituted the basis of the system which he so ardently expounded.

In the same letter he further illustrates his unique approach to problems of pathology and therapeutics in the case of haemorrhoids, which on this occasion led him to the discovery that the haemorrhoidal veins are derived from the portal vein and not, as currently believed, from the inferior vena cava. This investigation was carried out in order to gratify an assisting friend who was troubled with piles, and it enabled him to trace the radicles of the portal vein to the anal region.[13]

Convinced of the truth of his discovery he therefore felt constrained to describe a new pathway for the melancholic juice,[14] which, according to the humoral pathology, was the causal factor, and to propound a more rational mode of therapy.

By the time of the publication of the *Fabrica* in 1543, Vesalius had developed his ideas on the subject of the training and province of the physician and was highly critical of the medical education and standards of the physicians of his day. It will be recalled that under the influence of Arabian medicine and ecclesiastical prohibitions the practice of medicine had become divorced from that of surgery. In his dedicatory preface to Charles V, Vesalius makes a strong plea for unity. He emphasizes that although in ancient times physicians were divided into opposing sects, yet each embraced the whole of the art. He refers to manual operations as the " chief and most ancient branch of the medical art," but insists and reiterates the ancient view that the art of healing is of a triple nature—diet, drugs and manual procedures—and cannot be disunited and belongs in its entirety to the practitioner, and that rarely does a disease occur which does not require the triple manner of treatment. Anatomy is to him the foundation of the whole art but has been degraded and

[13] *Ibidem*, p. 59-61.
[14] *Ibidem*, p. 61-2.

ruined by those who have sacrificed surgical procedures to ignorant barbers.[15]

Fully occupied by anatomical investigation, the writing of the *Fabrica* and academic duties, Vesalius could have found but little time to supplement a meagre clinical experience. He is, however, always conscious of the clinical import of his studies, particularly when they may lead to a better understanding of traumatic lesions, and he frequently emphasizes the importance of a precise knowledge of the structure of the bones and joints and their relationship to fractures and the treatment of dislocations.[16] His observations on the position and nature of the epiphyses of bones is unique, and he clearly differentiates between a slipped epiphysis and a fracture or dislocation.[17] The first book of the *Fabrica* on osteology and arthrology is, from this point of view, the most important contribution in orthopaedic surgery since the classical treatises on fractures and dislocations of Hippocrates.

Anatomical dissection provides, often fortuitously, exceptional opportunities for the detailed and precise examination of morbid lesions. Vesalius was quick to appreciate the importance which such observations, if systematically undertaken both in the dissection room and on the patients in whom the physician had followed the progress of the disease to its termination, would have on the understanding of pathological processes. He therefore exhorts his readers to carry out autopsies for this purpose. *In privatis autem sectionibus, quae crebrius accidunt, utile erit quodvis aggredi, ut cuiusmodi id quoque sit expendas, corporum differentiam, veramque multorum morborum naturam assequaris.*[18] And three years later in the *China root letter* he once again announces in this connection, " I think I shall never fail to seize the opportunity of examining any bodies which are brought to my attention." [19] It will be remembered that it was his enthusiastic and energetic pursuit of this endeavor which, it

[15] *De humani corporis fabrica libri septem* . . . (Basileae, 1543). " *praefatio.*" Also, *VS.*, p. 46.
[16] Fabrica (1543), Lib. I, *passim.*
[17] *Ibidem*, Lib. I, cap. vi, 27.
[18] *Ibidem*, Lib. V, cap. xix, p. 548.
[19] *Epistola Chynae*, p. 176.

is apocryphally believed, eventually lead to his banishment or pilgrimage to Palestine and indirectly to his death.

In the *Fabrica* we find many incidental observations on pathological processes, the most remarkable of which are on the position and relations of the sac in inguinal hernia,[20] on hypertrophic osteoarthritis [21] and on the diseases of the spleen,[22] liver [23] and biliary tract.[24] But it is to the *China root letter* [25] of 1546 that we must turn for the finest descriptions of his autopsy findings. He believed that the post-mortem would not only lead to a better understanding of the nature of the disease processes, but would provide information as to the function of the organs themselves. But completely dominated by the Galenical physiology, the notions derived from such examinations proved to be of little worth. However few and scattered they may be, Vesalius's descriptions in precision and detail rank as the most significant contributions to morbid anatomy between Beniveni [ob. 1502] and Morgagni [1682-1771].

Vesalius's career as a clinician did not really begin until 1544 when he relinquished his professorship at Padua to assume a position as physician in the court of Charles V. Information on his life and practice during this period is very meagre. Apart from the *China root letter* of 1546 we have to rely for the most part on the few *consilia* [26] or letters of consultation to be found scattered in the publications of his contemporaries. The so-called *Chirurgia magna* [27] of Vesalius, issued by Borgarutius in 1568, is generally held to be a spurious work, although those familiar with Vesalius's style will find many passages in this work which are suggestive of his pen. An important additional source is the work on the theory and prac-

[20] *Fabrica* (1543), Lib. V, cap. iv, p. 495.
[21] *Ibidem*, Lib. I, cap. vi, p. 27.
[22] *Ibidem*, Lib. V, cap. ix.
[23] *Ibidem*, Lib. V, cap. vii.
[24] *Ibidem*, Lib. V, cap. viii.
[25] *Epistole Chynae*, p. 53, 139-42, 173-76.
[26] These consilia are collected in the appendix to M. Roth, *Andreas Vesalius Bruxellensis* (Berlin, 1892), which is hereafter cited as Roth.
[27] *Chirurgia magna in septem libros digesta . . . Ab . . . Prospero Borgarutio, recognita, emendata, ac in lucem edita . . .* (Venetiis, 1568); in Vesalius's *Opera omnia anatomica et chirurgica cura H. Boerhaave et B. S. Albini* (Leyden, 1725).

tice of surgery by his colleague, the Spanish surgeon Dionisio Daça Chacon [28] [1503-1576?]. Roth, the distinguished biographer of Vesalius, regards Daça as unreliable, apparently because of certain derogatory remarks made as to Vesalius's surgical ability. Roth confesses, however, that he had not consulted the work directly and relied on secondary sources for his information as to the content of this author.[29] There is good reason to regard Daça as an excellent witness. The work written by the author while in his seventies, is without doubt the most distinguished publication from a Spanish surgeon of the period. The first work of its kind to be published in the Spanish tongue, it is remarkable in that the author relies more on personal experience than on tradition, and where he filches from the work of others, as was the standard practice, that he should have selected from his outstanding contemporary, Ambroise Paré, who in more than one campaign was his opposite number in the opposing forces of France. Vesalius was both colleague and friend whom Daça held in the highest regard as " the greatest anatomist of the times " [30] and with whom he both consulted and operated.

Despite the tradition of the great Bologna school, of Guy de Chauliac, Henri de Mondeville and Lanfranc, the physician lost caste in Vesalius's day if he applied himself to surgical procedures. It was this which restricted Vesalius in the development of surgery for which his anatomical background so eminently fitted him and which provoked much of the violent criticism, opprobrium and enmity of his colleagues at the court of Charles V. In the *China root letter* of 1546, on the eve of the war against the Lutheran Schmalkaldic League, Vesalius had occasion to discuss the kind of lesions, such as fractures, dislocations and so forth, which he was likely to meet with in this campaign. He then goes on to say " when I see things like this [the foregoing] I cannot refrain from putting my hands to work, although I am generally compelled not to use them for those bodily affections in the cure of which I see that the true and highest power of medicine is established. Certainly those men

[28] *Practica y teorica de cirugia en romance y en latin* (Madrid, 1678), hereafter cited as *Cirugia*.

[29] Roth, p. 204.

[30] Daça Chacon, *Cirugia*, T. II, cap. xvii, p. 232.

who contend that the use of the hands does not concern a physician have perverted judgment. The physicians who advance this opinion are those with no knowledge of medicine except for some drugs that cleanse the bowels, and syrups that cause the evacuation of humours. . . . Furthermore, these pernicious men are not above speaking slander; if they notice any one who knows things of which they are ignorant, they admit that he is well versed in those subjects but deny that he is a physician. . . . Just as if a man should be considered a physician only when he is nothing else, or as if unlimited diligence in any of the branches of study subserviant to medicine would impair one's knowledge of the art itself. . . . And you know, when I first came to court how much the complete collapse of anatomical study in our age hindered me and was detrimental to the researches which I made with my medical students." [31]

Despite these restrictions, Vesalius's contributions to surgery are noteworthy, and his writings everywhere exhibit his great interest in elevating surgical standards. The several wars of the Holy Roman Emperor provided many opportunities for first hand experience in the handling of traumatic lesions. It is perhaps not surprising to find that in his early practice he shared in the universal belief of the times that gunshot wounds were poisoned. In 1544 at Landresi he employed the cautery and boiling oil, as recommended by Vigo and others for these wounds, "with which manner of treatment," as Daça tells us, "not only were the wounds festered with very great pain and other evil results, but the wounds became infected and putrid so that we were unable to examine them." [32] It was not, however, until the following year that Ambroise Paré's great contribution on the treatment of gunshot wounds was published,[33] and, if we can accept the internal evidence of Daça's work, we may assume that Vesalius likewise adopted the new method at an early date. At this time Vesalius begins to show some originality in surgical thinking by performing on a Flemish knight what appears to have been the earliest deliberate operation for the relief of osteomyelitis at the lower end of the femur, and with entirely favorable results.[34]

[31] *Epistola Chymae*, p. 39-40.

[32] Daça Chacon, *Cirugía*, T. II, cap. xxxiv, p. 261.

[33] *La methode de traicter les playes faictes par hacquebutes et aultres bastons a feu* . . . (Paris, 1545).

[34] Daça Chacon, *Cirugía*, T. I, cap. xiii, p. 69.

Vesalius's greatest contribution to the surgical art, apart from the anatomical, was the re-introduction of the classical operation for the drainage of an empyema. In the treatment of empyema, paracentesis by cautery and incision is mentioned in the Hippocratic aphorisms.[35] Galen in his commentary on this aphorism mentions that Euryphon, the celebrated Cnidian physician and contemporary of Hippocrates, recommended and used the actual cautery,[36] and this technique appears to have been that generally preferred because of the danger of hemorrhage from the intercostal vessels. On the other hand, low rib resection is advocated in the pseudo-Hippocratic work *On internal affections,*[37] and again by Celsus,[38] but both methods were seldom employed. Ingrassias gives high praise to Vesalius as the first to operate with his own hands in these cases . . *Vesalio interim anatomes parente propriis manibus operante, non tyranno quovis macellario . . . qui sese nunquam fecisse, nec alias ab aliquo se priore factam vidisse profiteatur.*[39] His first case occurred at Augsburg in the year 1547, but, according to Daça, the operation was unsuccessful, and in addition he says that Vesalius was slow with the knife.[40] Roth, although admitting that he had not seen the original text, regards this report as unreliable because of an error in the description of the operation and the uncomplimentary remark as to Vesalius's surgical ability.[41] However, the error of technical description would seem to have been magnified by Roth. Careful examination of the original text indicates that the author is describing the classical method as it appears in the Hippocratic collection. Daça's error is due to an omission rather than an error of description—failing to mention that it is the third rib as counted from *below*, over which the incision is made. This may well have been a *lapsus calami* of an author writing in the winter of his years.

[35] VII: 44.

[36] Galeni *opera* (Basileae, 1542), VII, col. 218; here it is numbered XLV.

[37] Oeuvres complètes d'Hippocrate . . . ed É. Littré, vol. VII (Paris, 1851), p. 166 ff.

[38] *De medicina*, Lib. VII,, cap. iv.

[39] *Quaestio de purgatione per medicamentum* (Venetiis, 1568), p. 99, "appendix" IV.

[40] Daça Chacon, *Cirugía*, II, p. 232.

[41] Roth, p. 219 and n. 4.

Vesalius's own discussion of the procedure in 1562 is a magnificent and brilliant piece of surgical writing in which he appears at his greatest. His experience at this time must have been fairly considerable, and he tells us that he had performed the same operation during the first few months of the year no less than four times: three in the case of thoracic wounds and once for a spontaneous empyema. In all but one of the first group the outcome was successful.

In the fields of pharmacy and therapeutics Vesalius's most important contribution was his analysis of the merits of the China root which had recently been introduced with high claims for its efficacy in the treatment of gout and syphilis. This simple, a variety of *smilax* allied to sarsaparilla, had been recommended to and employed by his royal master, the Emperor, who was ever eager in his credulity to adopt the nostrums of the quack to the despair and enragement of his personal physician. The stamp of imperial approval had excited the interest of every minor princeling, and their physicians were anxiously importuning the court for the secret methods of preparation and administration of this much vaunted panacea. The occasion of Vesalius's writing is in reply to such a request from his old friend Joachim Roelants, physician of Mechlin.[43]

Vesalius's method of presenting his analysis is novel and shows a healthy scepticism. He proceeds by introducing his clinical experience of its efficacy. He tells what little he knows of its provenance and describes the physical appearances of the plant. He examines the drug in terms of its qualities and faculties and analyzes its pharmacological effects in the light of these supposed qualities. He points out how ridiculous are many of its supposed virtues and sarcastically refers to the shelter of specious reasoning where " we too frequently take refuge, that is, in that secret and occult faculty which we call specific. . . . For this shelter is so wide that it encompasses everything, and we observe nothing abstruse and unknown which we do not assign to it." [44]

He discusses its method of administration, both local and general, and attempts to assess how much of the benefit is due to the regimen

[43] Ingrassi, *Quaestio de purgatione* (Venetiis, 1568), p. 92 ff.
[44] *Epistola Chynae*, p. [11]-12.
[44] *Ibidem*, p. 13-34.

and how much to the drug. He observes the effects of its use on the patient and compares these to those of such well known remedies as the guaiac, and concludes that the China root is of little worth, which fact but demonstrates the stupidity of the sick and the credulity for quack preparations of the public, who display " excessive admiration for these celebrated aliens . . . however much they are opposed to reason and to the method of our art." [45]

Throughout his discourse Vesalius demonstrates an acute familiarity with those questions of pharmacy which were exercising the minds of the advanced school, such as Brassavola, Ruellius, Matthiolus and the like, but in all, he here displays more obviously than elsewhere how complete was his acceptance of the whole stultifying system necessitated by the lack of any experimental method and failure to appreciate the objective and naturalistic spirit of Hippocrates.

The *China root letter* is a great advance in clinical thinking over the highly speculative opinions expressed in Vesalius's *consilium* of 1542, and by the year 1555 with the issue of the second edition of the *Fabrica* we find that he has developed an extensive practice, and he is beginning to speak as an experienced and self-confident practitioner whose opinion is now sought far and wide. It was in the latter year that Vesalius was called in consultation to Augsburg by Achilles Gasser and the younger Occo to examine Leonhard Welser, a patrician, in whom he made a positive diagnosis of an aneurysm of the descending aorta, which was proved at autopsy two years later. Vesalius states that prior to that of Welser he had seen no less than six such cases involving various vessels. The first case which came under his observation was a typical aneurysm of the first part of the aortic arch, probably of syphilitic origin, which eroded the sternum and anterior portion of the ribs.[46] Another, in the abdominal aorta, was demonstrated in the sister of the Cardinal Granvelle, and he makes the pertinent observation: *Si itaque nobis tam frequenter etiam in corpore latitans in vivis occurrit, quoties in cerebro et thoracis cavitate et circa os sacrum consistere, et nos latere poterit?* [47] Vesalius's observations on spontaneous aneurysm deserve

[45] *Ibidem*, p. 20.
[46] " Gasser consilium," Roth, p. 420.
[47] *Ibidem.*

to be better known, and although it is to Paré that the credit must go in suggesting syphilis as the cause,[48] nonetheless Vesalius's descriptions, though brief, are far superior to those of his distinguished contemporary.

A notable instance of the general respect held by both the court and the medical profession for the practical ability of Vesalius occurred in Paris in 1559. The prolonged struggle between France and Spain had come to an end with the much discussed treaty of Cateau-Cambresis. A few weeks later a high feast was held on the occasion of a double marriage, that of Elizabeth, daughter of the dull and melancholy Henry II of France, to the Spanish monarch, Philip II, and of the French king's sister, Margaret, to the Duke of Savoy. On June 30th, during a joust held in honour of the forthcoming ceremonies, the French ruler was mortally wounded above the right eye by the broken lance of his opponent, Gabriel de Montgomery, captain of the Scottish guard, and ten days later the king was dead.

The incident is mentioned by De Thou, Paré, Henricpetri and Daça Chacon. The last named writer, as a noted surgeon and as the friend and colleague of Vesalius, gives possibly the best account from the medical view-point. Immediately upon the wounding of the king, Philip sent to Brussels for Vesalius that he might come as rapidly as possible by special post. According to Daça Chacon no consultation was held until after the arrival of Vesalius, although many notable physicians were on hand. To honor Vesalius and his colleague [Daça Chacon], they were allowed to give their opinions last. Henry's royal physician announced that all had the greatest confidence that the king's health would result from what he might say. "Vesalius then gave his opinion with that Latin and the facility that I have seen in many consultations in which he took part, and treated of the essence of the wound, the signs and prognoses and the treatment of it which a good surgeon would be obliged to observe, and all with such wisdom that there was not much more to desire that could be more satisfying. . . ."[49]

[48] *Oeuvres complètes . . . revues . . .* J. F. Malgaigne, vol. I (Paris, 1840), Lib. VII, cap. xxxii.

[49] Daça Chacon, *Cirugía*, I, p. 174. De Thou remarks that Vesalius arrived

Three years later occurred the most important case of Vesalius's career. In 1562 Don Carlos, the *infante*, missing his step fell down a staircase at Alcalà and was thrown against a door at the foot. A period of unconsciousness followed, and physicians hastily summoned found him to be suffering from a small contused wound on the left side of his head in the region of the lambda, apparently penetrating to the bone. The prince was at once put to bed and promptly bled. Six physicians were in attendance, and all seemed to be going well until on the tenth day when a chill developed, and the prince's condition was considered grave. Deciding now to incise the skull the physicians were unable to determine, because of hemorrhage, whether the skull was injured or not. A message to the king brought him accompanied by Vesalius. The condition of the prince grew progressively worse, and a consultation of the physicians on the sixteenth day found them divided. Vesalius proposed trephining the skull, feeling that the lesion was within. In this opinion most of the others opposed him, although Daça Chacon admits "Vesalius had plenty of good reasons to support his view." Finally as a result of compromise rugination was decided upon, although Vesalius persisted in his view. Nevertheless three weeks after the accident little hope remained, and the failure of medicine led to the employment of quackery and the more gross forms of superstition. Yet Vesalius and his colleagues remained in constant attendance and finally were rewarded with some improvement in the patient. On the advice of Vesalius, the royal surgeon, Pedro de Torres, incised and drained both of the prince's orbits, and by July 5, after discharging a sequestrum from the skull, his convalescence had reached a point at which he could pay his respects to the corpse of the Blessed Diego and attend a bullfight all on the same day.[50] Such was the last and most momentous consultation of Vesalius's career.

late and could give no help. Paré makes no mention of Vesalius, but possibly national pride may here have played its role. A. Henricpetri, *Generalhistorien* (Basel, [s. a., ?1577]), p. cccIxvi, credits Vesalius with the deciding investigation, and it is of the anatomist that he expresses the desire "that Vesalius might have removed" the fatal results.

[50] John B. de C. M. Saunders, "Vesalius and Don Carlos a historical footnote," *Essays in Biology, in honor of Herbert M. Evans* (Berkeley, Calif., 1943), p. 531-38. A contemporary letter informs us that the drainage of the eyelids was

A complete lack of specialization was characteristic of the sixteenth century, a fact bemoaned by both Gesner and Cardan. Medical men dabbled in theology, philosophy, mathematics, astrology and any other subject which struck their fancy, while theologians, philosophers, men of letters, astrologists and other laity just as often attempted to practice medicine. Although this same tendency is mildly exhibited by Vesalius in his numerous asides, and defended by him, his writings show that he pursued with single purpose his own profession. Medicine he conceived as a whole and it is therefore not surprising to find that purely clinical consideration should prove so important in providing the impulse and direction to his anatomical investigations. To this must be added the powerful influence of the popular and reactionary reversion to the classics as the fount of all knowledge in which he participates by employing objective methods to aid in his textual criticism of the old masters.

An examination of his opinion on pathology and therapeutics is surprising in that there is almost no evidence of astrological and magical beliefs as were so common among his contemporaries. His therapeutics is remarkably free from the bizarre and superstitious remedies of the times and his approach to each problem reveals the most consistently logical exposition of the humoral theory as may be found in that century. Where he employs the observational method in pathology his descriptions, like those of his anatomy, are outstanding, and he is well aware that this method would achieve significant results. Likewise his surgical practice gives us a brief glimpse of considerable potentialities had circumstances allowed him to pursue this field without the fetters of traditional restraints.

carried out on the advice of Vesalius, but much against the opinion of several of the attendants.

VESALIUS AND THE PROBLEM OF VARIABILITY

WILLIAM L. STRAUS, JR. AND OWSEI TEMKIN

I

Medieval anatomy, just as other branches of medicine, was deeply influenced by Galen. In an age when science was bookish rather than experimental, one of Galen's anatomical works, "On the use of parts," acquired almost canonical significance. It is perhaps not quite proper to call "On the use of parts" an anatomical work, for it was at once more and less. The scope of the book was philosophical and theological; it intended to show that God had created the human body in the best possible way. A description of all the parts of the body was given together with an account of the functions these parts were presumed to fulfill. Then it was shown that the structure of each organ or part was admirably adapted to its predestined function, nay, that it was even impossible to imagine any better adaptation. Repeatedly the course of the narrative was interrupted by long sermons praising the glory and inimitable wisdom of the Creator.[1]

The religious fervor of the work appealed forcibly to a religious epoch and helped in making it the main source of medieval anatomical knowledge.[2] The influence had its good as well as its bad sides. "On the use of parts" is based on animal rather than human anatomy. Unfortunately in this work Galen does not make it very clear that his own dissections were performed on monkeys and other animals.[3] On the other hand, Galen often admonishes his readers

[1] An English translation of some such passages are given by Brock (*3*), p. 153 ff.

[2] The appeal which Galen's religiosity made to the Middle Ages has been pointed out by Singer (*22*), p. 62.

[3] Apart from frequent excursions into comparative anatomy and from *experiments* performed on the bodies of dead or living animals, Galen (*7*) mentions animal dissections in several places. Of these, the most important occur in II, 16 (vol. 1, p. 113, 17), VI, 4 (vol. 1, p. 307), VII, 1 (p. 375, 14), VII, 4 (p. 380, 20), XIV, 3 (vol. 2, p. 290, 2), XIV, 4 (p. 293, 26), XIV, 12 (p. 325, 5) XV, 8 (p. 367, 21), XVI, 12 (p. 430, 10). But even from these passages it is hardly possible to conclude that Galen always used animals for dissecting. Besides, there are many more

to study the structure of an organ by dissection.[4] This perhaps may help to explain some puzzling features of late medieval anatomy. In the mistaken belief that Galen had advised dissection of human cadavers and stimulated by the religious aim of anatomical work, medieval universities from the early 14th century on instituted public dissections. Guy de Chauliac, the greatest surgical author of that century, reflects this religious attitude when he says that the first reason for studying anatomy is to admire the work of God's creation.[5] And there is no doubt that Vesalius himself was imbued with a similar religious sentiment. In the chapter of the *Fabrica* where he describes the recurrent nerves, he says:

"With what great industry the fathomless Framer of our bodies has labored in these convolutions, you may see from dissection itself, from the present precise account of the distribution of the nerves, and from the figure which we have shown above. Nevertheless I advise you to consult Galen who rightly prides himself on having been the very first to find these looped courses of the nerves. In the seventh book of the use of parts, he sings veritable hymns to God and demands a more attentive mind than you would turn to the Eleusinian and Samothracian festivals or any other religious celebration, if you attended them willingly and intent upon what the priests say and do. For Galen is rightly convinced that the praise sung in his lines is in no way inferior to these celebrations and does not show in any lesser degree the incredible wisdom, providence and excellence of God, the Maker of all things." [6]

passages where he refers to dissection without indicating the nature of his material (cf. footnote 4).

[4] The main passages where Galen (7) advises dissection or praises autopsy without specifying the material to be used are II, 3 (vol. 1, p. 72, 2), III, 10 (pp. 168, 3 and 172, 10), III, 15 (p. 187, 4), IV, 12 (p. 217, 17), VI, 6 (p. 314, 15), VI, 14 (p. 349, 6), VI, 20 (p. 370, 3), IX, 8 (vol. 2, p. 22, 12 and 27, 23), IX, 11 (p. 33, 20), X, 3 (p. 62, 11), XI, 15 (p. 163, 4), XI, 20 (p. 180, 14 and 182, 2), XII, 2 (p. 184, 1), XII, 8 (p. 203, 2), XIII, 2 (p. 235, 26), XIV, 3 (p. 286, 23), XVI, 7 (p. 304, 17), XIV, 13 (p. 329, 9), XV, 1 (passim), XV, 5 (passim), XVI, 4 (p. 392, 13), XVI, 5 (p. 395, 25), XVI, 6 (pp. 402, 2, and 404, 9), XVI, 8 (p. 410, 3).

[5] Guy de Chauliac (4), fol. 1r: "Quoniam secundum Galenum medicorum lucernam, in libro nono de utilitatibus particularum, capitulo penultimo quatuor sunt commoditates scientiae anatomiae, una utique et maxime ad Dei potentiae demonstrationem" etc.

[6] Vesalius (25), p. 329.

If one assumes, as Galen did, that the human body has been created in the best possible way and that any different structure could only be for the worse, then it follows logically that there should be an anatomical *norm* representing the perfect man. That Vesalius really believed in a " canon " of the human body is indicated by a passage of the *Fabrica* where he reveals some of his pedagogic principles. After having discussed some rare variations of the azygos vein, he says that they should be judged like a sixth finger or any other monstrosity. In public dissections, he continues, he prefers to pass over them in silence lest the students believe that they occur in all bodies. Besides, experience has taught him that they greatly admire such monstrous forms. It is to the disadvantage of the students to attend the dissection of a body " which varies very much from the canon of man, unless they have frequently witnessed dissections of perfect and not monstrous cadavers." [7]

We celebrate Vesalius as the founder of human anatomy. The discovery that Galenic anatomy was animal anatomy was one of the main preconditions for his description of the human frame. But it should also be emphasized that his refutation of Galen was not due merely to his zeal as a dissector. It was his teacher, Winter of Andernach, who had translated Galen's " Anatomical administrations," a work apparently unknown to the Latin Middle Ages, into Latin and it was Vesalius himself who prepared this as well as some minor anatomical treatises of Galen's for the edition of Giunta during the critical years preceding the publication of the *Fabrica*.[8] Even a perfunctory perusal of the " Anatomical administrations " makes it quite clear that Galen used monkeys, dogs and other mammals for his dissections. But Galen the dissector is different from Galen the philosopher and theologian. Naming the animals used by him, carefully describing step by step what can be seen, Galen does not deny

[7] Ibidem, p. 280* (Here and in the following the asterisk refers to pages the numbers of which are wrongly repeated in the *Fabrica*.): ". . . quum interim ipsis dolendum magis esset, tale ad integram sectionem corpus obtigisse, quod ab hominum canone plurimum variat, nisi forte etiam crebro absolutorum et non monstruosorum hominum sectionibus astitissent, Galeni praecepta ad finem libri primi de Administrandis sectionibus nobis datum nunquam negligentes." Cf. also Roth (19), p. 85. For the reference to Galen, cf. below, footnote 10.

[8] Cf. Roth (19), p. 111.

the existence of individual variations. How objectively he could describe such variations may be shown by a reference in his treatise, "On the anatomy of veins and arteries," one of the works revised by Vesalius, where Galen discusses the renal veins and continues:

"Next to these, veins run to the testicles and these veins have one thing common to all monkeys and some things peculiar to single individuals. The common feature is this: from the left renal vein a branch leads off to the left testicle. The particular feature, however, is that sometimes the vein which goes to the testicle has a double origin, one branch coming from the left renal vein, the other from the vena cava. Sometimes, however, it has only one origin and springs from the vein which goes to the thigh. But the vein on the right side which goes to the right testicle originates from the vena cava itself. Once indeed I have seen this vein, too, with two origins, as is often the case on the left side." [9]

But Galen too had a warning for young anatomists. Whenever in dissecting a part they came across something that differed from Galen's own description they should refrain from condemning him until they had convinced themselves by frequent autopsies that they were not dealing with an individual variation.[10] It sounds almost like an echo of this passage when Vesalius, in the letter on the China root, claims that it is not his wont to affirm things which he has seen in one or two dissections only.[11]

It is well known that Vesalius made mistakes which had to be corrected by his successors. He also sometimes mistook pathological forms for normal structures. It is not our intention to point out faults of this kind. Instead, the question arose in our minds how the man who had to describe the human body purely by his own research would deal with what we call variations. In the work of Galen the idea of normal and perfect man as well as the principle of exact description had both come down to Vesalius. Without claiming any complete-

[9] Galen (8), vol. II, p. 809.

[10] Galen (8), *Administrationes anatomicae*, I, 11 (vol. II, p. 278): ἐὰν καὶ σοί ποτε μέλος ἀνατέμνοντι παρὰ τὰ γεγραμμένα πρὸς ἡμῶν φανῇ τι, γίγνωσκε τοῦτο τῶν σπανίων ὑπάρχον. διόπερ οὐδὲ προκαταγιγνώσκειν σε χρὴ τῶν πεπραγμένων πρὸς ἡμῶν. ἕχρι περ ἂν αὐτὸς καὶ σὺ, καθάπερ ἡμεῖς, ἴδῃς πολλάκις. This is the passage alluded to by Vesalius in the quotation in footnote 7.

[11] Cf. Roth (19), p. 108.

ness we wish in the following to give a few examples of how this idea and this principle appeared in the *Fabrica* of 1543.

II

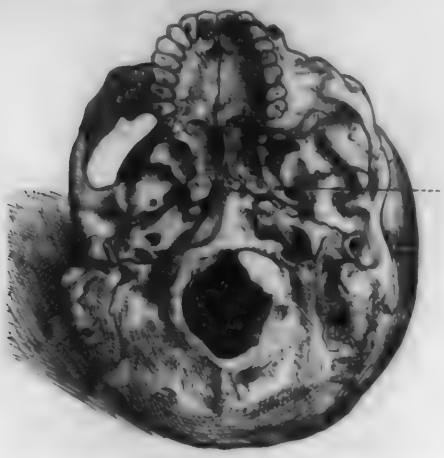
Vesalius was among the pioneers in the investigation of the variability of the human body. Singer (21) credits Eustachius (1520-1574) with the introduction of the study of anatomical variability. There is no doubt that Eustachius was considerably occupied with this phenomenon, but his work actually postdates that of Vesalius. It is not our purpose, however, to discuss the question of priority. In any instance, it is quite clear that not only did Vesalius recognize that variations in human structure do occur, but that he was greatly interested in this matter. There is little doubt that Vesalius dissected a considerable number of human bodies. In doing so he became faced with the problem of anatomical variability. He had to decide what was normal.[12] Much about his attitude toward the human body is revealed in his treatment of the variations that he encountered. The *Fabrica* of 1543 contains almost innumerable references to variations, and many of them are discussed in some detail. For our purpose, however, to ascertain how Vesalius dealt with the problems presented by these variations, it will suffice to examine only a few instances.

Vesalius possibly was the first to describe and figure a small foramen in the greater wing of the sphenoid bone, situated between the foramen rotundum and the foramen ovale, and traversed by a vein (fig. 1).[13] He states that " sometimes one may observe a small foramen at the internal side of that foramen which transmits the just mentioned pair of nerves [i. e. foramen ovale], and it is provided for a little branch of the same vein [i. e. internal jugular vein]. But it [i. e. the " small foramen "] is rarely seen on one side of the skull

[12] It should be pointed out that our modern terminology in many respects is very different from that of Vesalius. Instead of such terms as " normal," " abnormal," and " anomaly," he employs expressions which can be rendered by " always," " usually," " frequently," " more frequently," " most frequently," " sometimes," " not always," " rarely," " relatively rarely," " much more rarely," and " very rarely."

[13] *Fabrica*, figures on pp. 22, 24, 48 and text on p. 52.

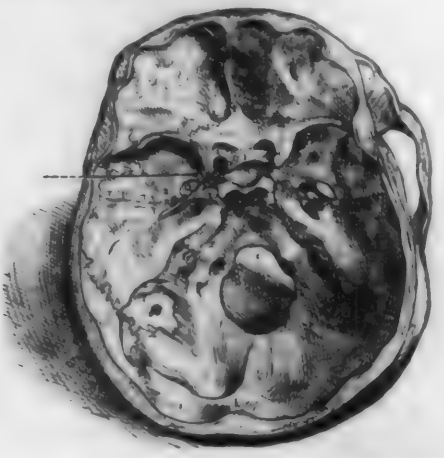
SECVNDA DVODECIMI CAPITIS FIGVRA.



HAC figura caluariæ baſis exteriorem factem, quâ palatum reſpicit, delineauimus. Nos enim hic caluam, ſeu caluariam, aut capitis oſſa non oculo illa quæ prius in ſexto & nono Capitub. oſſa capitis uocata ſunt, nominabimus: aut cum Ariſtotele capitis totum partem ea pilli to Lanuginem oculo illis oſſibus maxillâ ſuperiorem aduicinemus, idq; caluariam ſeu caput modo dicemus, quod in comitijs paſſim reperitur, & caluariæ loco pingitur. Quid autem ſupra capitis oſſa, maxillæ ſuperioris oſſib. diſtinxerimus, Galeni nomine & euidentioris doctrinæ ſtudio factum fuiſſe, hactenus abunde licuit colligere.

TERTIA DVODECIMI CAPITIS FIGVRA,

INTERNAM CALVARIAE BASIM COMMONSTRANS.



QVARTA

Fig. 1

Fabrica 1543, p. 48. Upper figure: base of skull seen from below. Lower figure: base of skull seen from above. In both figures the leader runs to the foramen Vesalii (S).

and still much more rarely on both sides. Nevertheless, we have pictured this foramen here on the left side and have indicated it by *S* in the second and third figures because among the rest of the skulls, there was one endowed with this foramen, and this skull looked more elegant than the others." This opening since has commonly been designated the "foramen of Vesalius." The vein that it transmits is a small emissary from the cavernous sinus to the pterygoid plexus, in turn often termed the "vein of Vesalius." That the foramen Vesalii is variable in occurrence, indeed rare, is quite clear to Vesalius.[14] Beyond this he makes no comment.

Considerable attention is devoted in the *Fabrica* to muscular variability. In dealing with the extensor muscles of the fingers Vesalius carefully describes and illustrates the variations of their tendons of insertion. He represents the m. extensor digitorum communis as being usually inserted upon only the second, third and fourth fingers, and thus it is portrayed in his figures (fig. 2 and 3).[15] In fact, this is a very common condition. But he recognizes that a fourth tendon of insertion, upon the fifth digit, also can occur, although he incorrectly regards this as very rare: "But I have very rarely found a tendon to lead right from the brachiale [i. e. carpus] to the little finger as to the other fingers . . . "[16] since, he adds, the m. extensor digiti quinti proprius produces extension of the little finger. He likewise notes the variability of the juncturae tendinum (without using this term) connecting the individual tendons.[17]

Vesalius appreciated the occurrence of the m. extensor digiti quinti proprius as a separate muscle, independent of the common digital extensor. He correctly states that it usually is inserted upon only the little finger (". . . but you will observe most frequently a single tendon leading to the little finger . . ."), and so depicts it (fig. 3).[18] Yet he also records and twice portrays the rarer condition in which

[14] Precise data on the frequency of the foramen Vesalii seem to be lacking. Modern anatomical textbooks, such as those of Bardeleben (1), Braus (2), Cunningham (5), Gray (9), and Morris (14), merely note that it is occasional or inconstant in occurrence.

[15] *Fabrica*, figures on pp. 194, 197, 219 and text on pp. 309-311.

[16] *Fabrica*, text on p. 311.

[17] *Fabrica*, p. 311.

[18] *Fabrica*, text on p. 311, and figure on p. 197.

Fig. 2

Fabrica 1543, p. 219. Posterior view of right arm. M. extensor digitorum communis (X) supplies tendons for fingers II, III and IV. M. extensor digiti quinti proprius (Y) for IV and V.

Fig. 3

Fabrica 1543, p. 197. In both hands the deep extensor muscle (π) is distributed to thumb (M. extensor pollicis longus) and index finger (M. extensor indicis proprius). In the right arm there also can be seen M. extensor digitorum communis (S) inserted as in fig. 2; M. extensor digiti quinti proprius (r), however, here is restricted to the little finger.

the muscle furnishes an additional tendon to the fourth finger (fig. 2),[19] a variation that is found only about once in every ten or more white bodies.[20]

In describing the deep extensor musculature of the fingers, Vesalius notes that the m. extensor indicis proprius can supply the index finger alone (fig. 3), or the third finger in addition (fig. 4). This latter fasciculus, often termed "m. extensor medii proprius," is known to occur in about one arm out of every ten.[21] Vesalius pictures both conditions, but which he regarded as normal, is not clear.[22]

Vesalius, moreover, recorded the absence of the m. palmaris longus, a circumstance which apparently he had encountered not infrequently. For in writing of this muscle, he states: "But more than

[19] *Fabrica*, text on p. 311, and figures on pp. 194, 219. The legend to the figure on p. 194 states: "Θ The muscle which will be considered to cause extension of the little finger. The mingling of the tendons of the muscle designated as Ƶ [i.e. m. extensor digitorum communis] and the muscle indicated by Θ [i.e. m. extensor digiti quinti proprius] which takes place at the root of the fingers, has here been delineated in the way in which it has occurred to us *more frequently* [italics ours]." The legend to the figure on p. 219 reads: "Ƭ The muscle by which as I shall show the little finger above all is extended." The discrepancies between these figures and their legends is obvious and curious. Notwithstanding, it is clear from the text on p. 311 that Vesalius rightly recognized insertion of m. extensor digiti quinti proprius upon the fourth finger to be anomalous. First, following Galen, he describes the muscle as having two tendons, to digits IV and V. He then continues: "Thus, too, you will not always see the eighteenth muscle [i.e. m. extensor digiti quinti proprius] carrying tendons . . . to both little and ring fingers, instead you will observe *most frequently* [italics ours] a single tendon leading to the little finger as the leader of the extension of this finger."

[20] Cf. Straus (23). Both Gruber (10) and Pira (17) record this variation as having a frequency of 6 per cent. Le Double (13) found it in 8.3 per cent of French and Wood (27), in 10.8 per cent of English.

[21] Cf. Straus (23). Wood (27) found it in 8.3 per cent of English, Wagenseil (26), in 12.9 per cent of Germans, and Straus in 9.1 per cent of Americans (both white and Negro).

[22] *Fabrica*, figure on p. 197 depicts this muscle as inserted only upon the index finger; while figure on p. 200 shows it as inserted upon both index and third finger. Strangely, however, the legend of each of these illustrations describes both insertions as being present. In the text (pp. 310-311), Vesalius first represents the m. extensor indicis proprius as having two tendons, for digits II and III. Then, following, he states: "Besides, you will observe that the tendon of this muscle does not always extend to the index and middle fingers, but to the index finger only."

Fig. 4

Fabrica 1543, p. 200. In the right hand, the deep extensor muscle (hanging down) differs from that of fig. 3 in that there is an additional fascicle for the middle finger (M. extensor medii proprius).

once in Padua and Bologna I have shown the muscle which we are describing to be certainly absent. . . ." [23]

Variations of the blood vessels also engaged Vesalius' attention. Thus, for example, he points out that the coeliac artery can arise

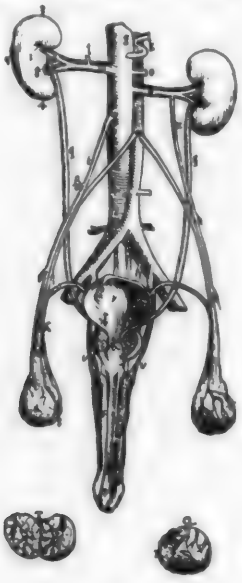


Fig. 5

Fabrica 1543, p. 374. The usual arrangement of the internal spermatic veins. The left spermatic vein (X) empties into the left renal vein (n), whereas the right spermatic vein (t) drains into the inferior vena cava (g).

from the aorta either as a single trunk or by two separate branches.[24] He devotes considerable space to a description of variations of the vessels that drain the testicles, the internal spermatic veins. These

[23] *Fabrica*, p. 303. Absence of the m. palmaris longus by no means is rare. According to Loth (12), it is wanting in from 10 to 20 per cent of whites, the frequency differing in various racial groups.

[24] *Fabrica*, figure on p. 295* depicts one branch; figure on p. 297*, two branches. See also legend on p. 297.* The biramous arrangement is relatively rare: Eaton (6) found it in only 9.3 per cent of the 206 bodies that he examined.

veins are pictured six times. Four of these figures show the customary human conformation, with the left spermatic vein draining into the left renal vein and the right spermatic vein emptying directly into the inferior vena cava (fig. 5).[25] Vesalius clearly recognizes this arrangement as normal, for he states that " . . . in the figure of the bare and entire vena cava we have represented the origin of the seminal veins as it shows itself more frequently to the anatomists. . . ." [26] A fifth illustration exhibits a normal right vein, whereas the left spermatic vessel empties by separate branches into both the renal vein and the vena cava (fig. 6). Of the latter, anomalous branch, Vesalius says: " For although this little vein occurs relatively rarely it has nevertheless seemed right to represent it since in the other figures the left vein is delineated without this one and since it does not obscure anything here." [27] The sixth figure depicts both of the spermatic veins, left and right, so terminating in two branches, " . . . a branch extending from the trunk of the vena cava to the seminal vein on the left side and joining together with it," and " . . . a branch originating from the vein which presents itself to the right kidney and this branch joins with the right seminal vein " (fig. 7).[28] In addition to the variations thus figured, Vesalius describes yet another, an instance in which the entire right spermatic vein joined the right renal vein.[29]

All of the variations thus far discussed are treated by Vesalius from a quite objective point of view. As a matter of fact, if we allow for differences in mode of expression and for differences in terminology, or rather for lack of terminology, they are wholly modern in spirit. Vesalius is describing human anatomical variability as he finds it without undue speculation on its significance.

[25] *Fabrica*, figures on p. 268*, 312, 374, 378.

[26] *Fabrica*, legend to figure on p. 289.* Also see text, p. 288.*

[27] *Fabrica*, figure on p. 372 and legend.

[28] *Fabrica*, figure on p. 289* and legend. The text on pp. 288*-289* elaborates upon these variations.

[29] *Fabrica*, p. 289.* There appears to be a singular current lack of information respecting the variations of the internal spermatic veins. Most modern textbooks completely ignore their existence. Quain (18) states that the veins sometimes bifurcate, sending one branch to the vena cava and the other to the renal vein. Piersol (16) notes that the left vein occasionally opens directly into the vena cava.

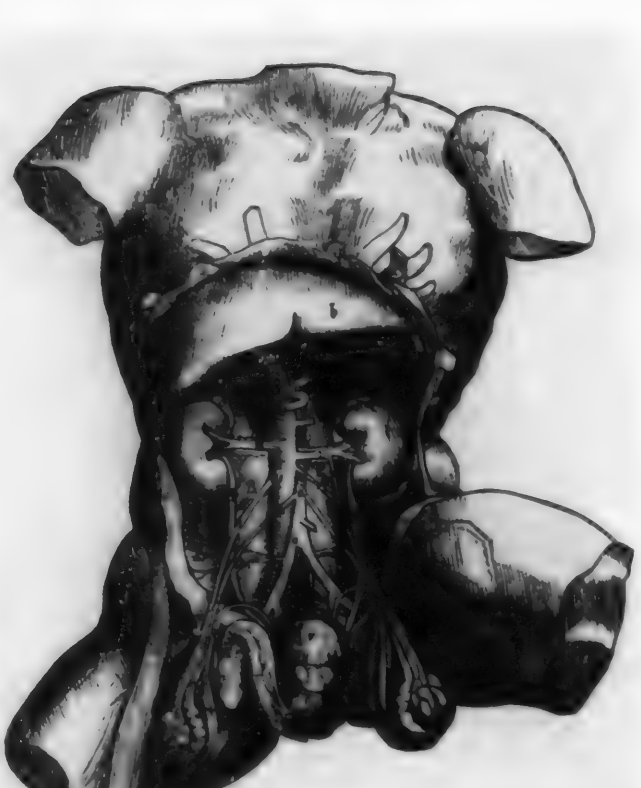


Fig. 6

Fabrica 1543, p. 372. The right internal spermatic vein (t) is as in fig. 5. The left internal spermatic vein, however, empties by two branches (x, y), into the left renal vein and the inferior vena cava, respectively.

But we obtain a somewhat different impression when we turn to the instance of the os sacrum. This bone is clearly pictured five times in the plates and in each instance is composed of six vertebrae (fig. 8).[30] The accompanying figure legends and the text likewise speak of six

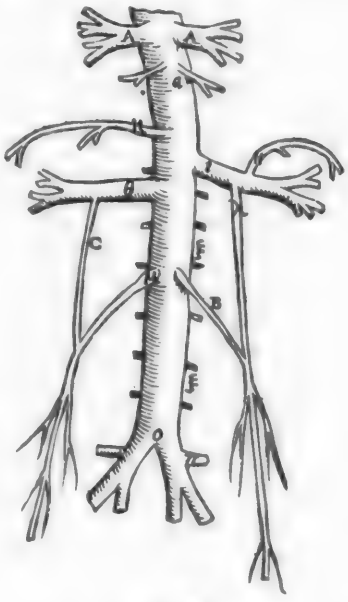


Fig. 7

Fabrica 1543, p. 289.* Inferior vena cava, showing the two internal spermatic veins, each of which ends as two branches—entering inferior vena cava and renal vein, respectively (B and λ on left side, μ and C on right side).

parts as being most common: "Below the lumbar vertebrae in man one usually finds ten bones, of which six constitute the os sacrum of man, and four the coccyx."[31] We now know, however, that a sacrum of five vertebrae is normal for man, although one of six components

[30] *Fabrica*, figures on pp. 57, 79, 332, 333, 354.
[31] *Fabrica*, p. 83. Also see p. 84.

DE OSSE SACRO, ET OSSE COCCYGE. Caput XVIII.

PRIMA DECIMI OCTAVI CAP. FIGVRA. SECVNDA.

Fig. 8

Fabrica 1543, p. 79. Sacrum, composed of six vertebrae, and coccyx, composed of four vertebrae.

by no means is rare, having a frequency of about one in five.[32] Vesalius also recognized the existence of the five-piece sacrum, pointing out that " sometimes it [i. e. the sacrum] consists of five bones only. . . . "[33] Apparently he did not encounter the rarer sacral types comprising four and seven vertebrae, respectively. It may pertinently be asked how Vesalius came to regard the sacrum of six parts as typical, or normal, despite the fact that one of five segments is almost four times as frequent. Certainly it did not arise from a poverty of material, for his reference to " the sacral bones met with in cemeteries " [34] patently may be taken as an indication that he had examined numerous specimens. Vesalius, himself, in later life, tried to explain and justify his choice of the six-piece sacrum by stating that he happened to have a particularly good specimen of that type available; and that he selected this because it conformed more closely to Galen's description.[35] It is difficult to see why Vesalius felt it so necessary to concur with Galen here, especially when he was in such violent and outspoken disagreement in other instances. Moreover, his explanation is not readily reconciled with his definite and repeated statements in the *Fabrica* of 1543 to the effect that the six-piece type is the most frequent form of sacrum. On the other hand, he clearly pictures a five-piece sacrum, accompanied by a coccyx of four parts, in the *Tabulae Sex* published five years earlier (fig. 9).[36] Something in the interval caused him to

[32] According to the data assembled by Schultz (20) relative to 631 white bodies, the sacrum was composed of 5 vertebrae in 77 per cent, of 6 vertebrae in 21.7 per cent, of 4 vertebrae in 1 per cent, and of 7 vertebrae in 0.2 per cent.

[33] *Fabrica*, p. 84. Cf. also p. 76.

[34] *Fabrica*, p. 83.

[35] Roth (19), p. 146. Cf. also Holl (24), p. 11.

[36] *Tabulae Sex*, 1538, sixth table. This is a posterior view of the skeleton. Five sacral and four coccygeal vertebrae are evident. The accompanying legend states that sometimes there are nine vertebrae below the lumbar region and accuses Galen of inconsistency on this point. In the *Fabrica*, however, the text on p. 83 states that "below the lumbar vertebrae in man one usually finds *ten* [italics ours] bones, of which six constitute the os sacrum of man, and four the coccyx." The figures on p. 79 similarly show *ten* postlumbar vertebrae (six sacral and four coccygeal), whereas the accompanying legend curiously reads: " A, B, C, D, E, F, G, H, I, K. These letters in the first figure designate *nine* [italics ours] bones following upon the fifth lumbar vertebra. Of these I shall consider the six superior ones to represent the os sacrum in man, while I shall call the four inferior ones . . . coccyx

Fig. 9

Tabulae Sex, 1538. Sixth table, showing sacrum, composed of five vertebrae, and coccyx, composed of four vertebrae.

change his mind. A possible motive for his choice of the six-piece sacrum as normal is suggested in his teleological attitude toward the relation between sacral foramina and nerves. Obviously Vesalius regards the foramina as having the purpose of protecting the nerves as they pass from the spinal cord to the periphery. He is at pains to prove that this end also is attained with a five-piece sacrum, but only by the additional provision of special processes on the coccyx.[37] Thus he writes, " . . . if perchance the sacrum is constructed of five bones only . . . the first bone [of the coccyx] forms two pointed little processes on the posterior side [i. e. cornua coccygea] so that some foramen may be formed on the posterior side and the nerve of the sixth pair in the sacrum be let out and protected. The little processes show upwards and are strongly united with the processes of the fifth bone of the sacrum [i. e. cornua sacralia]. . . . But if the sacrum has six bones (as happens most frequently), the first bone of the coccyx does not form any such processes. . . ."[38] It is not implausible to suppose that Vesalius, steeped as he was in a Galenic brand of teleology, thus was led to regard the six-piece sacrum as the more perfect, and so to look upon the variant as the normal.

We now come to instances where Vesalius' approach to the problem of variability plainly is influenced by teleology. There first are to be considered the oft-discussed Vesalian bones of foot and hand. In the foot, Vesalius describes and figures " . . . an ossicle situated at the external side of the joint by which the fifth bone of the pedion [i. e. os metatarsale V] articulates with the cuboid bone " (fig. 10).[39] The precise nature of this so-called " os Vesalianum tarsi " as described in the *Fabrica* of 1543—whether it be a rare accessory tarsal element, or an anomalous separate tuberosity of the fifth metatarsal bone, or even nothing more than the sesamoid of the peroneus longus muscle— has been the subject of considerable discussion and has

or (as we sometimes say) os coccygis." In the light of the *Tabulae Sex*, is it possible that this reference to nine bones represents something more than an ordinary slip of the pen? The whole question of Vesalius' treatment of the sacrum in the *Tabulae Sex* and the *Fabrica* has been discussed at some length by Holl (24).

[37] *Fabrica*, p. 84.

[38] *Fabrica*, p. 84. Cf. also figures on p. 79, where the first coccygeal vertebra exhibits no cornua.

[39] *Fabrica*, p. 150, and figures on p. 142. Also see the legend to these figures.

produced diverse interpretations. Whatever its exact nature, it seems that Vesalius regarded it as a normal structure, or at least he did not comment upon its significance. Not so, however, is his treatment of the Vesalian bone of the hand. This, termed the "os Vesalianum carpi," as depicted and described by Vesalius, is an

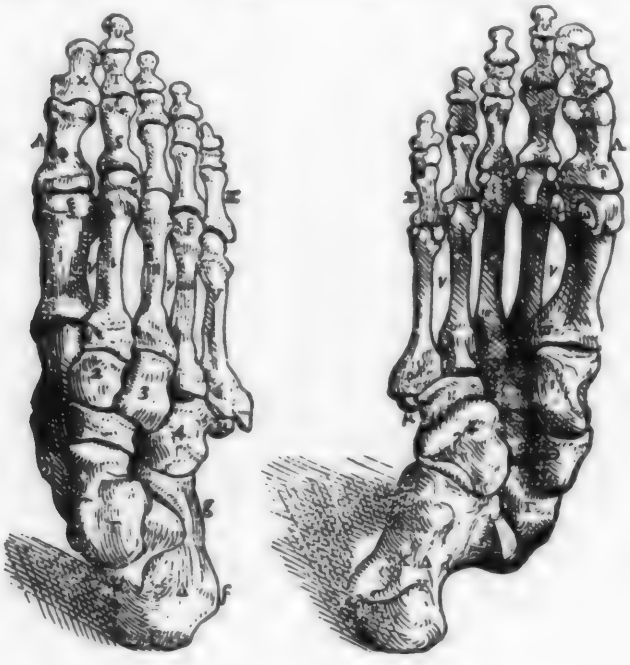


Fig. 10

Fabrica 1543, p. 142. Skeleton of foot, showing os Vesalianum tarsi (μ).

ossicle "sometimes" present and lying ". . . at the external side of the articulation of the postbrachial bone supporting the little finger [i.e. os metacarpale V] with the eighth brachial bone [i. e. os hamatum] . . ." (fig. 11).[40] Vesalius regarded this ossicle and that which he found in the foot as analogous.[41] Both he placed in the

[40] *Fabrica*, p. 119, and figures on p. 115. Also see the legend to these figures.
[41] *Fabrica*, p. 150.

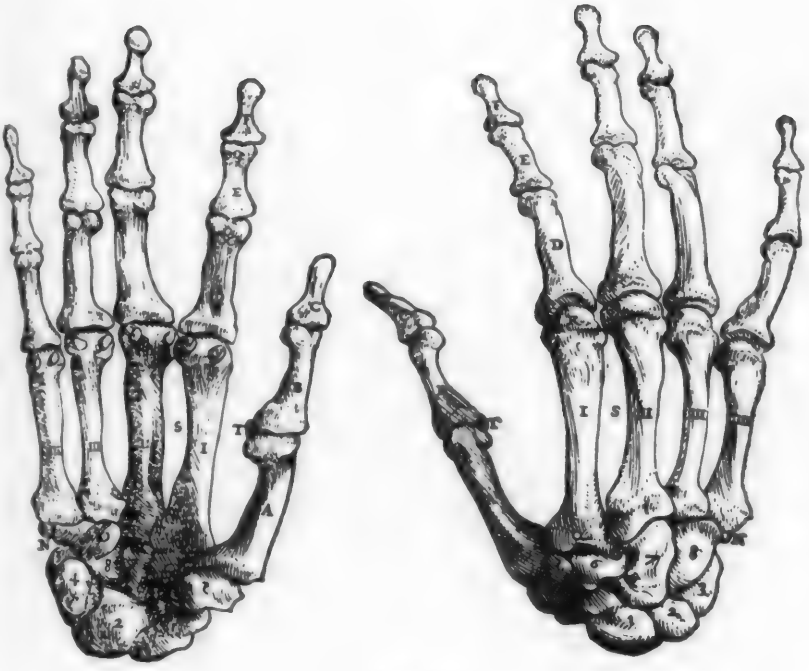


Fig. 11

Fabrica 1543, p. 115. Skeleton of hand, showing os Vesalianum carpi (N).

category of sesamoid bones (although there is no indication that he used this term in its strict modern connotation).[42] His account of the os Vesalianum carpi, however, is dominated by teleology. Actually, he is describing an extremely rare anomaly, in fact, one of the most exotic of all skeletal aberrations.[43] He scarcely could have seen it more than once. Yet, despite its abnormality, of which he plainly is cognizant, it is to him almost a necessity in his concept of the perfect hand. For to him this anomalous ossicle appears to fulfill the function of supporting the little finger and of filling an otherwise "somewhat empty" space along the ulnar border of the hand. Thus he states that it has ". . . the object so to speak of filling the place completely. For the latter remains somewhat empty because the superior part of this postbrachial bone [i. e. os metacarpale V] cannot completely lean upon the eighth brachial bone [i. e. os hamatum] and deviates a little toward the external side. In particular this ossicle, when present, seems therefore to strengthen this joint and somewhat to prop up the postbrachial bone supporting the little finger. And for this reason the eighth brachial bone also borders upon this ossicle. . . ."[44] Consequently the os Vesalianum carpi assumes an exaggerated importance in the eyes of its discoverer, and its rarity is ignored in the face of teleological necessity.

Finally, we come to the form of the skull. Vesalius groups skulls, according to shape, in five categories.[45] Much has been written about his classification.[46] It is not our intention to discuss it here. Suffice it to state that whatever its resemblance to the classifications of modern anthropologists, it differs fundamentally in both spirit and purpose. Rather, it follows good Galenic tradition.[47] For Vesalius, there is only one "natural" form of skull, all variants therefrom

[42] *Fabrica*, p. 119.

[43] Pfitzner (15) found an os Vesalianum carpi in only 2 of the 1,456 European hands that he studied (thus in slightly more than 0.1 per cent). Furthermore, he categorically states that this bone, following its original description by Vesalius in 1543, was not encountered again until Gruber saw it in 1870—a matter of 327 years!

[44] *Fabrica*, p. 119.

[45] *Fabrica*, figures on p. 18 and text on pp. 18-19.

[46] Cf., e. g., Holl (11).

[47] Galen (8), *Ars medica*, ch. 6 (vol. I, p. 319 ff.).

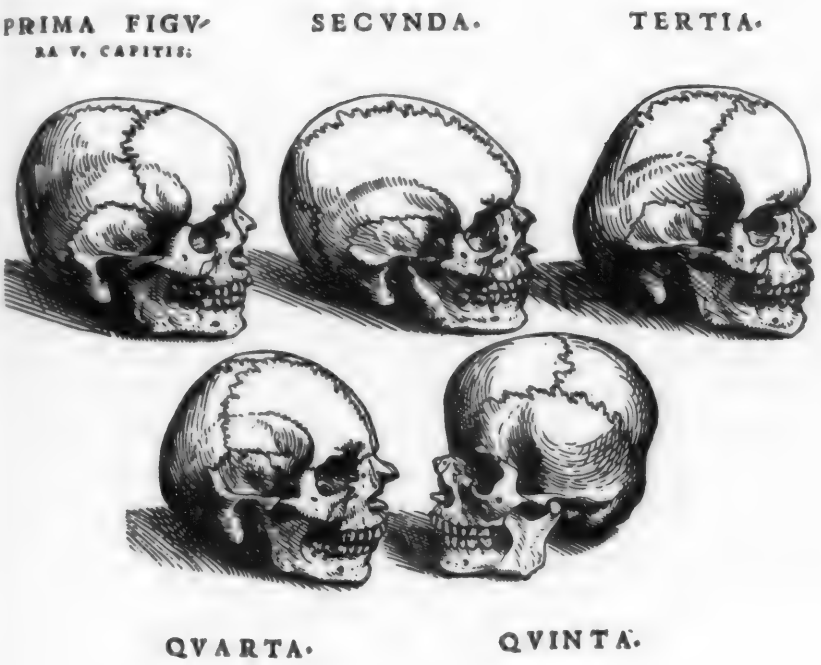


Fig. 12

Fabrica 1543, p. 18. The five types of the human skull. Of these, only the first ("Prima figura") is considered as "natural" by Vesalius.

being regarded as unnatural.[48] He states: " . . . And for this reason too, the skull which is according to nature is chiefly built in the shape of an oblong sphere, where the anterior [literally " foremost "] parts are more prominent and larger. But all the other figures which vary from this one, are believed not to be natural . . ." (fig. 12).[49] Here we see the teleogical attitude toward variability, suggested in the discussion of the sacrum and further developed respecting the os Vesalianum of the hand, carried to its logical conclusion.

As emphasized above, we have not made a complete survey of the *Fabrica*. Consequently, we have no information as to the exact number of references to variations contained therein. Nor are we able, from the examples of variations which we have studied, to state definitely whether the objective or the teleological point of view prevails. Our impression, however, distinctly suggests predominance of the former. The point to be emphasized, however, is that the treatment of variability in itself varies, thereby reflecting Vesalius' attitude toward the human body.

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[48] It is to be noted that Vesalius, when he becomes thoroughly teleological, as in this instance, tends to employ different terms than those used in purely objective descriptions.

[49] *Fabrica*, figures on p. 18 and text on p. 19.

Verhandel. kon. Akad. Wet. Amsterdam (sect. 2), 1897, *5* (6): 246 pp.

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A DISCUSSION OF THE TWENTY-FIRST ILLUSTRATION OF THE FIFTH BOOK OF *DE HUMANI CORPORIS FABRICA* (1543)[1]

JOHN A. BENJAMIN*

I know of no statement which is more fitting to introduce a subject from the "Fabrica" than the one by Virchow:[2]

> Vesalius war einer jener seltenen Männer von universaler Bedeutung, wie sie die Geschichte nur selten auftreten sieht; wie in ihm fast alle Culturnationen des damaligen Europa . . . einen Angehörigen sehen und verehren konnten, so erkannte man die Gültigkeit seiner Siege in der Anatomie zugleich für alle anderen Zweige der Medicin an.
>
> (Vesalius was one of those rare men of universal importance that history can record but infrequently; just as almost all of the cultured nations of Europe at that time . . . were able to recognize and honor him as kinsman, so the validity of his victories in anatomy was recognized and applied to all other branches of medicine alike.)

Since the Fabrica is so comprehensive in its text one will do well to concern himself with some small section of it. It is the purpose of this paper, therefore, to discuss the illustrations of the kidney and the type of kidney dissected, man or animal, on page 371,[1] and to give Vesalius deserved recognition for his contribution to renal anatomy.

Material and Methods

The kidneys of man, pig, and dog were studied in the fresh state and after fixing in Pick's solution. Additional studies were made on the same kidneys after the injection of liquid latex and pantopaque

[1] Vesalius, Andreas. De Humani Corporis Fabrica Libri Septem. Basel, Joannes Oporinus, 1543.

[2] Virchow, Rudolf. Morgagni und der anatomische Gedanke. *Berl. klin. Wochnschr.*, *31*: 345-350, April 2, 1894 (p. 347). See also *Lancet I*: 843-846, Apr. 7, 1894; and *Bull. Hist. Med.*, *7*: 975-989, 1939.

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PLATE 1

Fig. 1. Pyelotubular backflow of diodrast is shown by the fan-shaped area at either kidney pole. Pyelovenous backflow is not as easily produced in the dog as in man or in the pig.

Fig. 2. The kidney pelvis has been filled with a mixture of liquid latex and pantopaque and because of its viscousness the pelvis is not as completely filled as it is with diodrast, which is less viscous.

Fig. 3. Note the kink in the normal ureter which was produced intentionally. The prolonged white areas project over the membranous body of Vesalius and also correspond to the position of the blood vessels.

½ Actual size.

VIGESIMAPRIMA QVINTI LIBRI FIGVRA

QVAE TRES PROPRIAS CONTINET TABELlas sectionis serie inuicem subsequentes, ac appositissimè renũ sinus meatuumq; urinariorum principia ostendentes.

PRIMA. SECVNDA. TERTIA.

f 2 TRIVM

TRIVM VIGESIMAE PRIMAE FIGVRAE TABELLArum, earundemq; characterum Index.

PRIMA tabella sectionem secundùm renis longitudinem per gibbum ipsius inductam habet adeò profundam, ut in secundum renis pertingat sinum, interim nulla renis substantiæ abla
α,β. ta portione. Significet igitur α dextri renis anteriorem partem, β uerò posteriorem. γ & γ ori
γ,γ. ficia sunt ramorũ primi sinus renis, seu ipsius mẽbranei corporis, quæ inuicẽ illi rami coeunt. Hic
δ,δ. enim rami necessariò per sectionem in mutuo coitu diuiduntur. δ, δ primi sinus corpus, seu membranecum corpus in quod uena & arteria renis terminantur.

ε Foraminulum hoc urinarij meatus est initium.

λ Vrinarij meatus pars. Super membrancum hoc corpus δ & δ insignitum, secundus renis constitit sinus, cuius interius & corpori illi membraneo proximum latus in hac sectione tantum apparet. Eius enim partes quæ in exteriora ad uterung; sepi ex renis substantia conformati latus pro
ζ,η. ducuntur, ipsumq; sinum uelut bipartitum efficiunt, nisi stpecillo in circuitu sub ζ hic & η deducto intueri nequis. Septum namq; illud præsenti sectione in duas partes, anteriorem scilicet & posteriorem diuisum cernitur, ac η quidem partem ipsius notat anteriorem, ζ uerò posteriorem.

Secundæ effigiei omnia cum nuper commemorata sunt cõmunia, nisi quòd uniuersa propemodũ renis substantia septum illud constituens, cultello orbiculatim adempta sit, neque aliter sanè septi illius figuram ob oculos ponere licuit. Conspiciter hic itaq; secundus renis sinus uniuersus, at non quemadmodum est bipartitus, eo quod septum abstulerim sinum hunc in exteriori ipsius late
ε re dirimentem. α igitur & β & γ & λ eadem hic quæ in prima tabella notant. Circulus autem
β. inter α & β ductus, secundum renis indicat sinum. β uerò anteriorem partem primi sinus, seu mem
ι branei corporis, qua hæc in ramos discinditur. ι corporis membranei posteriorem partem indi-
κ. cat. adeò ut β & ι simul membrancum notent corpus, seu primũ renis sinum: κ autem urinarij meatus insignitur origo. Tertia tabella primi sinus seu membranei corporis ramos omnes insinuat. renis enim substantia, quæ summis eius sinus ramis adnascitur, penitus detracta est. Atq; hæc citra charactrum operam sunt obuia.

Fig. 1. Shows the three Vesalian (1543) illustrations of a kidney in successive stages of dissection and legend with characters.

Fig. 1

The twenty-first illustration of the fifth book, which contains three appropriate drawings of a dissection, following one after another in succession, and showing, in a very suitable manner, the principles of the sinus (cavity) of the kidneys and of the urinary passages.

A legend of the three figures of the twenty-first illustration, and of their characters:

The first illustration has a dissection following the length of the kidney, cut through its hump just deep enough that it extends into the second cavity of the kidney, no portion of the parenchyma of the kidney having been removed, however. It shows, therefore, α the anterior part of the right kidney, β in fact, the posterior. γ & γ are the orifices of the branches of the first sinus of the kidney, or of its membranous body, where these branches in turn unite. For here the branches in common union are necessarily divided because of the dissection. δ, δ the body of the first cavity, or the membranous body in which the vein and artery of the kidney are terminated.

ε This little opening is the beginning of the urinary passage.

λ Part of the urinary passage. Above this membranous body, designated δ & δ, may be found the second cavity of the kidney, of which the inner side, nearest its membranous body, merely shows in this dissection. For parts of this, which are extended into the outer walls on both sides of the septum formed from the parenchyma of the kidney, form this same bisected sinus, and I cannot look into it unless a probe is drawn in a circle under ζ, here & H. For the septum, in the section showing it, is seen divided into two parts, namely the anterior & the posterior, and κ denotes its anterior part, surely; ζ indeed the posterior.

Of the second illustration, everything is common with that just described, except that the almost complete parenchyma of the kidney forming this septum is cut away in circles with a little knife, not is it permitted, to be sure, to place the form of its septum before the eyes. And so here is seen the entire second cavity of the kidney, but not as if it were bisected, because I have taken away the septum separating this sinus in its outer wall. α therefore, & β & γ & γ designate the same things here which they (designated) in the first illustration. Moreover, the circular duct between α & β indicates the second sinus of the kidney. θ, in truth, the anterior part of the first sinus, or of the membranous body where these are divided into branches. ι indicates the posterior part of the membranous body. In the same manner, and at the same time, θ & ι denote the membranous body or first sinus of the kidney; (by) κ, moreover, the origin of the urinary passage is indicated.

The third illustration penetrates into all the branches of the first sinus or membranous body, for the parenchyma of the kidney, which is connected to the sinus by its uppermost branches, is cut into deeply. And these are obvious from the list of characters near by. (p. 372)

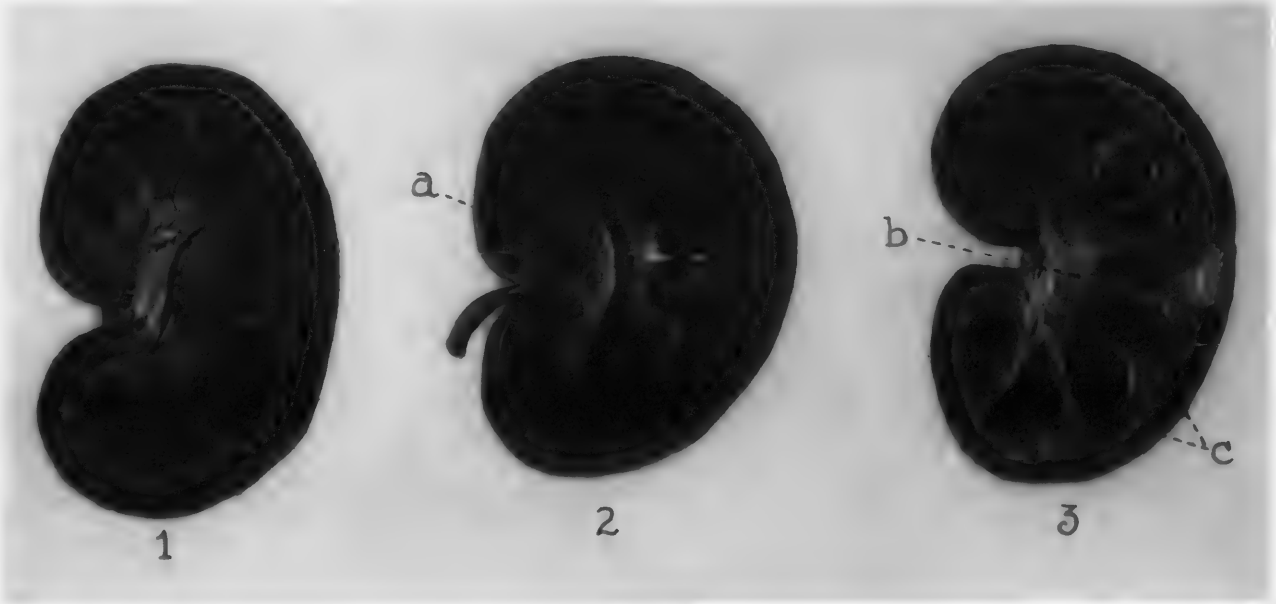


PLATE 2

This plate shows three successive stages of dissection of the kidney of the dog to permit comparison with Fig. 1.

Fig. 2a. Orifice of the ureter.

Fig. 3b. Membranous body or the first cavity of Vesalius.

Fig. 3c. Projections of the membranous body and cut ends of the vessels incased in this structure.

Actual size.

mixture.* Such an injection medium not only permitted one to cast a mold of the pelvis, but also made it possible to obtain X-rays of the specimens. Still another medium, diodrast,** was used to inject the ureter and pelvis and under pressure to produce pyelotubular back-flow [3] in the kidney of the dog.

The first illustration (Fig. 1) shows the kidney cut sagittally dividing it into anterior and posterior halves, and emphasizing the symmetry of the halves. The anatomic topography is further clarified by reference to the "hump" or the convexity of the kidney (Fig. 1, & Pls. 2). Perhaps one may call attention to one detail. Vesalius referred to the membranous body (first cavity) before describing the pelvis (second cavity, Pl. 4, Figs. 1, 2); ordinarily the pelvis would be the first to be dissected and described. Probably the branches marked "γ" attracted his attention immediately upon opening the kidney, and since he observed this cavity it seemed reasonable to label it the first cavity with the observation of the pelvis second.

He described the first cavity and noted the finger-like projections uniting near the hilus of the kidney (Pl. 2, Fig. 3b). Furthermore he found that the membranous body enclosed the vein and the artery (Pl. 3, Fig. 3a), the first cavity or membranous body being one and the same structure.

The orifice of the ureter which drains the urine from the kidney pelvis is also seen in the first illustration (Fig. 1 & Pl. 2, Fig. 2a). He then wrote of a bisected cavity (pelvis) which is shown in Pl. 3, Figs. 2b & 3b. He further divided the membranous body into anterior and posterior portions maintaining uniformity of terms and anatomic position.

The usefulness of a probe in this dissection is indicated in the legend. Furthermore, I feel that the use of the probe is some evidence of his knowledge of surgical instruments and technique. More-

* Equal parts of pigmented liquid latex and pantopaque (ethyl iodophenylundecylate) were mixed and adjusted to pH9.9 by adding ammonium hydroxide. If a denser medium is necessary for x-ray studies then add more pantopaque and adjust pH to 10.78 by adding ammonium hydroxide.

** diodrast-diiodopyridone acetic acid diethanolamine (35% wt./vol.).

[3] Hinman, Frank. The Principles and Practice of Urology. Phila., W. B. Saunders Co., 1935, p. 235.

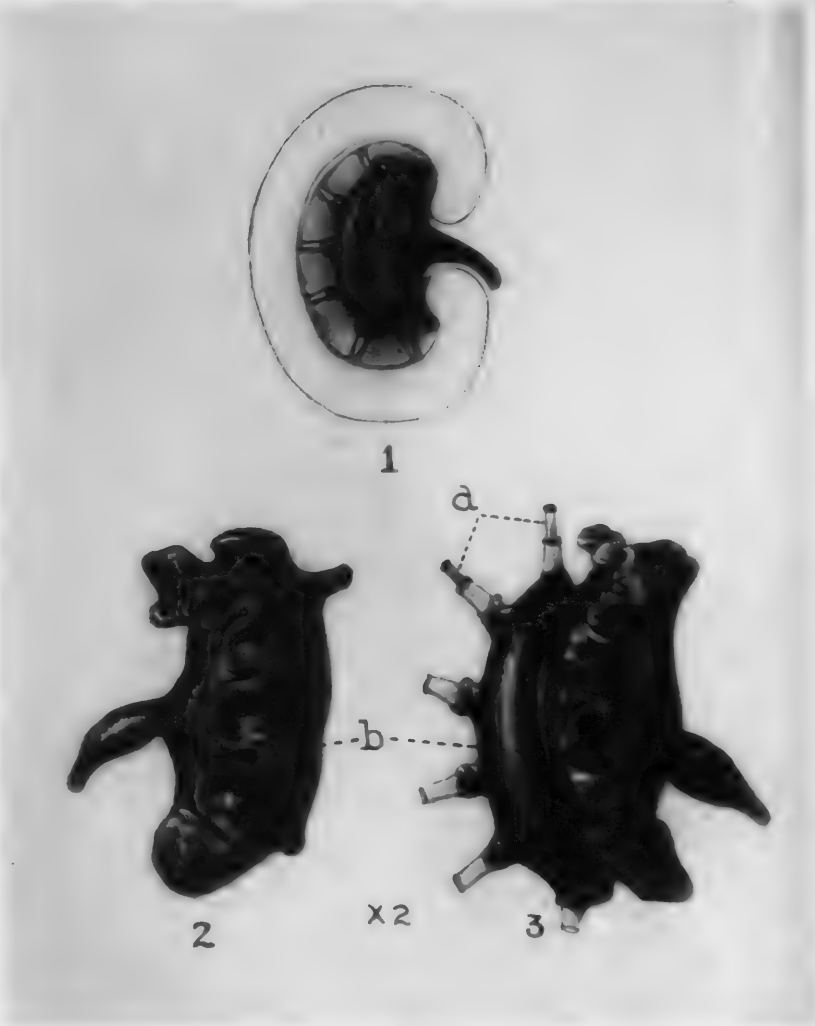


PLATE 3

Fig. 1. Injection medium mold of the pelvis showing its relation to the membranous body or first cavity, after dissecting away the renal crest and some of the parenchyma.

Figs. 2, 3. b. indicates the bisected pelvis.

Fig. 3. a. shows the vessels (diagrammatic) in the membranous body.

Fig. 1. Actual size.
Figs. 2 & 3. X2.

PLATE 4

Figs. 1, 2. An x-ray of the mold of the dog's ureter and pelvis made by injecting liquid latex and pantopaque. Arrow points to the space occupied by one projection of the membranous body.

½ Actual size.

over, we have evidence in the Preface of the Fabrica [4] that Vesalius was interested in surgical anatomy, and he realized it was necessary to dissect in order to study organ and body structures.

Porro Patavii . . . , quia ad medicinae chirurgicae professionem . . . Anatomes quoque tractatio pertinet, eam in hominis constructione inquirenda navavi operam, . . . (Praefatio, p. 3).

Furthermore at Padua . . . [I had been in charge of the teachings of surgical medicine] . . . and since the carrying out of anatomical inquiry is of importance for surgical medicine, I devoted much effort to the investigation of the structure of man.[5]

We note that his description of the second illustration is to the point. He wasted neither time nor words. His logic was good, his thinking clear. He took scalpel in hand and dissected away the parenchyma, exposing the membranous body.[6]

He states:

Of the second illustration, everything is common with that just described, except that the almost complete parenchyma of the kidney forming this septum (renal-crest *) is cut away in circles with a little knife, nor is it permitted, to be sure, to place the form of its septum before the eyes. And so here is seen the entire second cavity * of the kidney, but not as if it were bisected, because I have taken away the septum separating this sinus in its outer wall. α therefore, & β γ & γ designate the same things here which they (designated) in the first illustration. Moreover the circular duct (Fig. 3) between α & β indicates the second sinus of the kidney. θ, in truth, the anterior part of the first sinus, or of the membranous body where these are divided into branches. ι indicates the posterior part of the membranous body. In the same manner, and at the same time, θ and ι denote the membranous body or first cavity of the kidney; (by) H moreover, the origin of the urinary passage is indicated (in the second cavity).

* The pelvic wall forms recesses and outpouchings (Pls. 3 & 4). The pelvis is adapted to receive the renal crest projections and it is prolonged outward between the ridges, forming cavities for the latter, and simulates calyces, which do not exist.[6a]

[4] Farrington, B. The Preface of Andreas Vesalius to De Fabrica Corporis Humani, 1543. *Proc. Roy. Soc. Med.*, *25*: 1357–1366, 1932.

[5] Singer, Charles. To Vesalius on the Fourth Centenary of his De Humani Corporis Fabrica. *J. Anat.*, *77*: 261-265, 1943. (See p. 263 for discussion of the word "fabrica.")

[6] (See Pls. 1, 3, 4).

[6a] Sisson, Septimus. The Anatomy of the Domestic Animals. Phila., W. B. Saunders Co., 1917, p. 570.

The description of the third illustration is brief. The first cavity or membranous body is fully demonstrated by removing all but a thin rim of parenchyma (Fig. 1 & Pl. 2, Fig. 3). At this point a comment about the kink in the ureter is essential (Fig. 1 tertia, & Pl. 1, Fig. 3). Several of my doctor friends have remarked upon this, and questioned if any pathology existed such as a hydronephrosis (unless experimentally produced, hydronephrosis in the dog is rarely seen). I feel that there is no question but that the kink is produced by the artist intentionally and is reproduced in Pl. 1, Fig. 3 (observe normal ureter with kink produced intentionally).

In regard to pathology in general at this time we can again borrow words of explanation from Virchow[2] (p. 348):

In der That wissen wir, dass von Eustachi bis auf Vesalius die pathologisch-anatomischen Abweichungen die Aufmerksamkeit der Anatomen beschäftigt haben, aber weder sie noch ihre nächsten Nachfolger haben diese Abweichungen mit der Sorgfalt verzeichnet dass darauf die Begründung einer thatsächlichen Krankheitslehre hervorgehen konnte.

(In fact we know that from Eustachius to Vesalius the pathologico-anatomical variations attracted the attention of anatomists; however, neither they nor their immediate successors have recorded carefully those deviations from the normal, so that the founding of a real pathology could not result.)

Little was known of renal pathology at this period, yet dropsical persons could scarcely have escaped notice at any time in the history of the world. Horace[7] himself must have seen such a case of albuminuria when he sang:

Crescit indulgens sibi dirus hydrops,
Nec sitem pellit, nisi causa morbi
Fugerit venis, et aquosus albo
Corpore languor.

(By indulgence the dreadful dropsy grows apace, nor can the sufferer banish thirst, unless the cause of the malady has first departed from the veins and the watery languor from the pale body.)

It is also probable that Vesalius had read Saliceto (1476) who left a classic description of a contracted kidney producing dropsy (De duritie in renibus. Cap. cxl).[8]

[7] Quintus Horatius Flaccus. Opera omnia. 3rd ed. Oxford, Clarendon press, 1896. Vol. 1, Lib. II, Od. 2, p. 136, lines 13-16.

[8] Garrison, Fielding H. An Introduction to the History of Medicine. 4th ed. Phila., W. B. Saunders Co., 1929, p. 154.

Just as Virchow stated that the founding of a real pathology was not possible under the circumstances; therefore, we may put this subject aside and return to the question: "Did Vesalius dissect a human kidney or the kidney of an animal?" (Fig. 2, & Pl. 5, Fig. 1.)

Holl [9] has carried out an inquiry in a thorough manner into this particular phase of the work of Vesalius. We may now examine two of his statements.

Auf den ersten Blick hin ist ersichtlich, dass die Abbildungen keine menschlichen Nieren betreffen können, obwohl dies die Figurenerklärung verschweigt. Die Abbildungen haben tierische Nieren (und zwar, wie später hervorgehen wird, die eines Hundes) zum Gegenstande und es hätte Vesal die Verpflichtung gehabt, dies in der Figurenerklärung ausdrücklich hervorzuheben. Dadurch, aber, dass Vesal dies unterlassen hat, war die Gelegenheit gegeben, dass ein seinerzeitiger Leser (und vielleicht auch mancher der gegenwärtigen Zeit), der nur die Abbildungen und die Figurenerklärung einsah, irregeführt werde.

(It is evident at the first glance that the illustrations do not represent human kidneys, even though the text does not mention that. Vesalius should have emphasized in the text that the illustrations show kidneys of an animal (as we shall later see, a dog). Because Vesalius neglected to do that, the opportunity arose to be misled for his contemporaries and probably also for his present readers, who only looked at the pictures and explanations of the illustrations.)

In support of the above statement we do know that Vesalius dissected dogs and pigs,[10] and also removed a kidney (probably a dog's).

Quanquam et vivos canes, qui modo paulo aut multo ante cibum sumpserunt, vivos aggredi, atque ita etiam intestinorum munus rimari, nihil prohibeat. Jecoris autem officium, ut etiam lienis, aut renum aut vesicae, in vivorum sectione vix melius quam in mortuorum intueri possumus. Nisi quis vivo cani lienem execare voluerit, uti et ego aliquando feci, diebusque aliquot canem asservavi. (p. 660)

(However nothing may prevent our taking even living dogs which have consumed food at less or greater intervals previously and examining them alive, and thus investigating the functions of the intestines. But on the contrary we are able to behold the functioning of the liver as also of the spleen

[9] Holl, M. Vesals Darstellung des Baues der Niere. *Arch. f. Gesch. d. Med.*, *6*: 129-148, 1912 (p. 129).

[10] Lambert, Samuel W. A Reading from Vesalius and the Physiology of Vesalius. *Bull. N. Y. Acad. Med.*, *12*: 345-415, 1936. (See also *Proc. Charaka Club*, *8*: 3-41, 1935.)

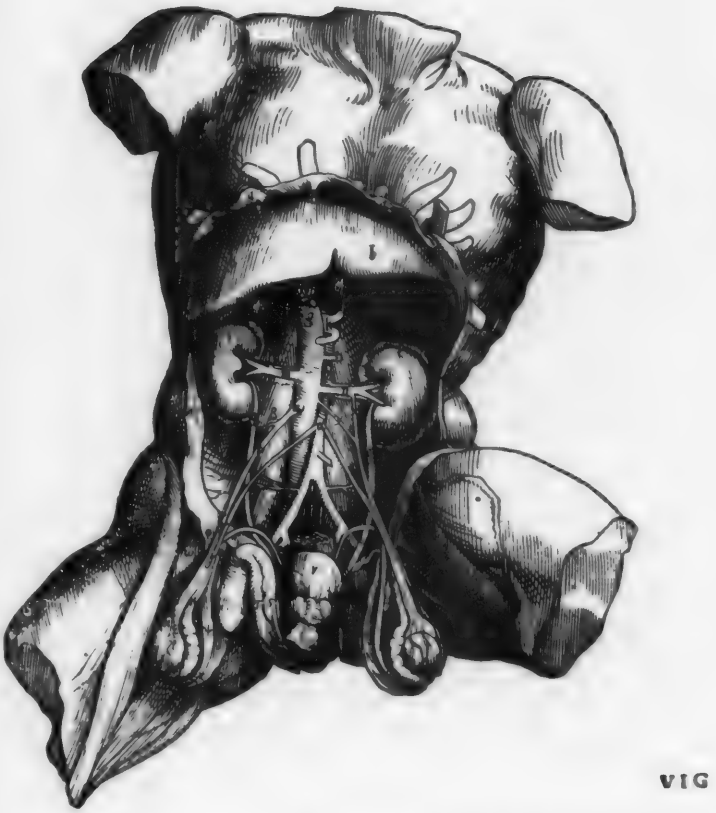


Fig. 2. The kidneys of the human are seen *in situ* and are not dissected (1543 ed.).

PLATE 5

Figs. 1, 2, 3 show the structural differences between the kidney of the human (fig. 1), the pig (fig. 2), and the dog (fig. 3). Note the fat about the pelvis in the human and pig kidneys. (See comment of Holl in this paper.)

½ Actual size.

or of the *kidneys* or of the bladder during dissection of the living, scarcely better than in the dead; unless someone shall wish to excise the spleen in the living dog which I have once done, and have preserved the dog (alive) for some days.)

Hac figura suem asseri, quem vivis sectionibus administrandis parare solemus, ac ultimo primi libri capite cum reliquis anatomicis instrumentis proposuimus, alligatam conspicis, ut modus quo in nostris scholis utimur, aliqua ex parte foret obvius. (ed. 1555, p. 822)

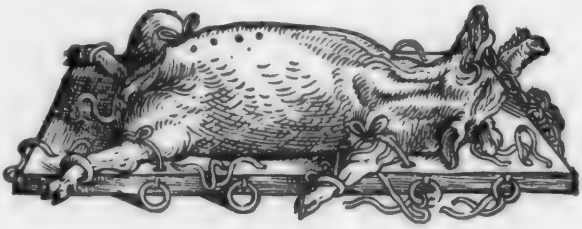


Fig. 3. A pig is bound to the plank for vivisection (1543 ed.).

(In this figure one sees a *pig* bound to a plank (Fig. 3) as we are accustomed to prepare one for performing a vivisection, and we have displayed in the last chapter of the first book the remaining anatomical instruments in order that the method which we use in our lectures shall partly be made evident.)

Atque ita etiam renem aliquando execui: verum vulneris curatio molestior est, quam quae hinc sumitur cognito jucunda. Nisi quis non tam organorum cognitionis ratione has sectiones aggrederetur quam ut manum exerceat, ac abdominis vulnera apte suere discat. (p. 660)

(And thus also have I once excised a *kidney*, in truth, the management of this wound is more troublesome than the pleasant knowledge which is acquired in the doing of it; unless one undertakes these dissections not so much for the sake of the knowledge of the organs as in order to train his hands, and to learn to sew up wounds of the abdomen in a fitting manner.)

Holl continues with his investigation into the type of kidney dissected by Vesalius.

Vesals Angabe endlich, dass die Hunde- bzw. Ziegenniere für das Studium des Baues der Niere geeigneter sei als die Menschenniere, welche von Fett erfüllt sei und weiter, dass fette Menschen ebenso wie die Schweine den zweiten Sinus mit härtlichen Fett erfüllt haben, spricht nur dafür, dass Vesal das Innere einer menschlichen Niere niemals gesehen hat. (p. 139)

(Vesalius' statement that the kidney of a dog or goat [11] is a better study object than the human kidney, which is filled with fat, and furthermore, that fat people have the second cavity filled up with fat just like pigs, speaks only to the fact that Vesalius never saw the inside of a human kidney.*)

The fact that Vesalius observed the fat in the human kidney (second cavity or pelvis, Pl. 5, Figs. 1 & 2) is very significant because to make and record this observation he had, at least, to open the kidney, therefore a dissection was started.

It is evident from the work of Holl and from the anatomical structures and illustrations presented in this paper that Vesalius did dissect a kidney (or kidneys) of a dog. However, it is my feeling after making this study that Holl failed to give Vesalius full credit for his contribution to the renal anatomy of the dog.

Addendum

Through the kindness of Dr. Owsei Temkin of the Institute of the History of Medicine and Dr. William L. Straus, Jr., of the Department of Anatomy, both of the Johns Hopkins University, School of Medicine, the following article by Schmutzer [13] was brought to my attention, after submitting this paper.

Since this study by Schmutzer gives strength and confirmation to my paper it seems justifiable to reprint several passages.

Daher ist man nach Holl (S. 131) " zur Annahme berechtigt, dass Vesal seine

* See Fig. 2 for dissection of human body showing kidneys *in situ*. It is of interest to note the illustration from Valverde [12] (Pl. 6) and the marked similarity to those of Vesalius; more comments are beyond the scope of this paper. For further discussions of the work of Valverde, see: 1. Vesalius, Andreas. Epistola, rationem modumque propinandi radicis chynae decocti . . . Basel, Joannes Oporinus, 1546. 2. Larkey, Sanford V. The Vesalian compendium of Geminus and Nicholas Udall's translation. *The Library*, ed. by A. W. Pollard, Lond., *3*: 367-394, 1933. 3. Reichert, F. L., and Mathes, M. E. Anatomy in the making. *Stanford Med. Bull.*, *1*: 55-61, 1942.

[11] Vesalius, Andreas. De Humani Corporis Fabrica Libri Septem. Basel, Joannes Oporinus, 1555, pp. 630-635 (p. 633).

[12] Valverde, Juan de. Vivae Imagines Partium Corporis Humani. Antwerp, C. Plantin, 1566.

[13] Schmutzer, Richard. Vesals Darstellung des Baues der Niere, Ein Nachtrag zur gleichnamigen Arbeit Holls, im *Arch. f. Gesch. d. Med.*, *6*: 129-148, 1913; *Arch. f. Gesch. d. Med.*, *27*: 187-188, 1934.

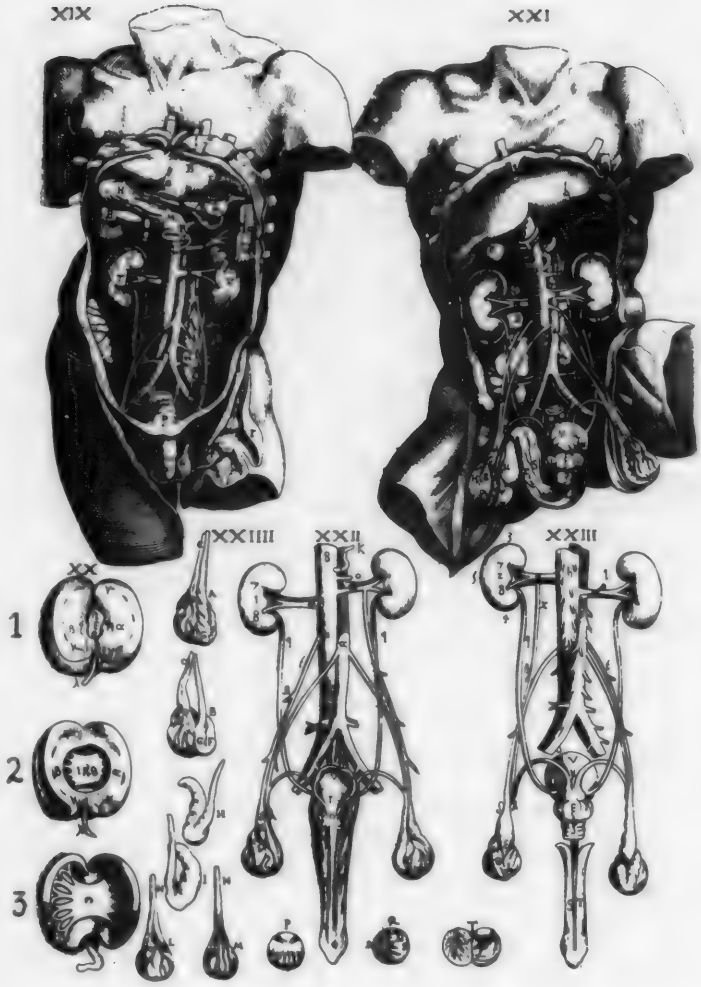


PLATE 6

Figs. 1, 2, 3. Note the marked similarity of these illustrations to those of Vesalius (see Fig. 1). Valverde appears to be freeing his conscience by varying the end projections of the membranous body so that graceful arches and smooth connections are formed. (Compare XXI of Pl. 6 with Fig. 2.)

Darstellung des Baues einer tierischen Niere auch für den Menschen gelten lässt."

(According to Holl (p. 131) one is "led to the conclusion that Vesalius thought his description of the structure of the kidney of an animal was also valid for the kidney of a human.")

Diese Annahme wird zur Gewissheit, wenn man Vesals Anweisung zur Präparation (S. 554) liest, auf die er in dem von Holl nicht vollständig zitierten Satz (aus S. 516) noch verweist und die Holl nicht herangezogen hat.

(One may accept this statement for a certainty when one reads the Vesalian precept on preparation (p. 554) which Holl did not reprint in full and yet reprimanded (Vesalius), and in which Holl did not even interest himself.)

Der Index sodann verweist unter "renis canini ad humanum differentia" lediglich auf S. 516, Z. 9, wo der von Holl, wie erwähnt, unvollständig zitierte Satz beginnt, der sich an die Kritik der bis dahin üblichen Nierenbeschreibung anschliesst: "Damit du das unglaublich erkünstelte (dieser Darstellung) erkennst (Quod incredibile artificium ut videas), möchte ich, dass du eine Hundeniere, die nämlich mager und nicht wie die menschliche mit Fett durchsetzt (pinguedine oppletum) ist, zur Hand hast und zuerst (vor der menschlichen) so, wie ich die Präparation (administrationem) der Niere am Schluss dieses Buches anfügen werde, in Angriff nimmst." Damit ist als einziger Unterschied zwischen Hunde- und Menschenniere die Fettlosigkeit der ersteren konstatiert, im übrigen aber die völlige Gleichheit der beiden.

(In the Index "renis canini ad humanum differentia" refers to p. 516, line 9, where Holl, as mentioned before, begins his incompletely reprinted sentence. Herewith you recognize the incredible pretence (of this presentation) (Quod incredibile artificium ut videas, Holl, p. 130). May I suggest that you take a kidney of a dog to examine which is thin, and not like that of a man which is overrun with fat, and first (before the human) I take the preparation of the kidney in hand as set forth in the closing chapter (XIX) at the end of this book (V). "Quod incredibile artificium ut videas, caninum renem utpote macilentum, et nulla, quemadmodum humanus est, pinguedine oppletum, ad manum tibi esse velim, illumque uti renis administrationem ad presentis libri calcem subiungam, te primum aggredi. (p. 516, line 9) Furthermore the leanness of the former (dog) is stated as the only difference between the kidney of a dog and of a man, the full similarity of both remains.

At this point it is informative to reprint a sentence from p. 554:

Quapropter operaeprecium fuerit, canis renem diligenter prius examinare, et ex illo dein humanum cognoscere. (See Schmutzer, p. 187)

(Therefore it is worth the effort to study the kidneys of the dog industriously, and from them to learn to know the human kidney.)

Schmutzer continues:

Ungeachtet dieser sehr weit gehenden Unzulänglichkeiten ist Vesal stolz auf die von ihm entdeckte Einrichtung der Nieren, renum a me repertam constructionem, wie er sich in seiner Epistola de radice Chyna (Basel 1546) S. 138 ausdrückt, wobei er auf die ausführliche Beschreibung in der Fabrica hinweist.

Apart from this gross inadequacy Vesalius is proud of the fact that he discovered the (anatomical) arrangement of the kidneys (renum a me repertam constructionem) as he points out in his "Epistola, rationem modumque propinandi radicis chynae decocti . . ." (Basel, 1546, p. 138, line 18), in which he refers to the detailed description in the Fabrica (1543).

Acknowledgments

I am deeply grateful to Margaret Butterfield, Head of the Classification Department, and Curator of Local History and University Archives at the University of Rochester for her careful English translation of the legend in Latin, to Mr. Natt C. Jacobs for his outstanding illustrations, to Mr. Merwyn C. Orser for the well-defined photographs, and to Dr. C. E. Tobin for the injection medium and method of injection, the last three named are at the University of Rochester, School of Medicine and Dentistry.

ALBANUS TORINUS AND THE GERMAN EDITION OF THE *EPITOME* OF VESALIUS

HENRY E. SIGERIST

In the summer of 1542 Vesalius had completed the manuscripts of the *Fabrica* and *Epitome*. The wood-blocks of the many illustrations were ready also. Sample prints of some of them had been made and had been inserted into the manuscript. All that remained to be done was to ship the precious material safely over the Alps to Oporinus in Basle.

In August 1542 Vesalius was in Venice. The academic year was over, and he had been granted a leave of absence from the University of Padua for the coming year.[1] His sole purpose at that time was to see his books safely through the press. On August 24 he wrote a long letter to Oporinus giving detailed instructions as to the printing, and announcing that he himself would come to Basle soon and would stay there "if not through the entire printing period, then at least for some time."[2]

The letter was to be sent with the manuscript and wood-blocks, and it is very likely that the shipment left Venice soon after August 24 because the season was fairly advanced. Snow might be expected in the mountains at any time, and one false step of a mule would have caused irreparable damage.

Cushing thinks that the caravan went "almost certainly by way of Chiavenna and over the Bernina Alps by the Splügen Pass to Chur, the Walensee, Zurich and Basel." It is possible that the route taken was over the old Roman road that led over the Splügen Pass, but in that case the Bernina Alps were not touched since they are far to the east of the Splügen Pass. It seems, however, more probable to me that the precious shipment went over the St. Gotthard Pass.

[1] The documents are in Moritz Roth, *Andreas Vesalius Bruxellensis*, Berlin, 1892.
[2] Oporinus published the letter in the *Fabrica* fol. 5. It was partly translated by Harvey Cushing, *A Bio-Bibliography of Andreas Vesalius*, New York, 1943, p. 76 f.
[3] *Ibid.*, p. 78.

It was entrusted to the Milan firm of Danoni and the most frequented route leading from upper Italy to Basle was the St. Gotthard.[4]

We do not know when the manuscript and plates arrived at Basle, probably in September or early October, but we can well imagine the excitement they must have created when they were finally delivered into the hands of Oporinus.

A few months later, in January 1543, Vesalius himself arrived, and he stayed at Basle for at least seven months. Following the custom of the time he registered with the University. The usual matriculation fee was waived in the case of distinguished visitors, and Vesalius, young as he was at the age of twenty-eight,[5] was received as a highly distinguished visitor.[6] He enjoyed the protection of the imperial court, was professor in a famous university, had already a great reputation for his writings, and everybody in Basle knew that he had come for the publication of a monumental work.

■

The University of Basle at that time was not quite a century old, having been founded in 1460.[7] Like all universities in communities that had been stirred by the Reformation, it went through a very critical period, during the years 1529-1532. Some of the professors, among them Albanus Torinus, followed the movement and became Protestants. Others who remained loyal to the Catholic faith, left the town with their students. The University was closed in 1529, and since there was danger that it might be transferred to some other, to a Catholic town, the City Council seized its archives, funds, seal, and other emblems.

Three years later, in 1532, the University was reopened as a Protestant institution. The City Council invited the faculties to submit reports about the various courses of study, and the report of the Medical Faculty presented in 1536 stated that instruction should

[4] See Aloys Schulte, *Geschichte des mittelalterlichen Handels und Verkehrs zwischen Westdeutschland und Italien mit Ausschluss von Venedig*, Leipzig, 1900, 2 vol.

[5] His printer Oporinus was thirty-six years old in 1543.

[6] The entry into the matricula reads: *D. D. Andreas Vesalius Bruxellensis ob merita nihil.*

[7] See Albrecht Burckhardt, *Geschichte der Medizinischen Fakultät zu Basel, 1460-1900*, Basel, 1917.

follow the course of nature, discussing conception, birth, the vital forces, structure and function of the organs, nature and symptoms of diseases, prognosis and therapy. Instruction was to be based on the study of Hippocrates, Galen, Paulus of Aegina and Dioscorides, read in the Greek originals. Botanical excursions in the summer and the public dissection of a cadaver every year or every two years, were declared to be essential parts of the course.[8]

In 1543 when Vesalius was in Basle, the medical faculty included two full professors. One of them, Oswald Bär, was *professor medicinae practicae*, a graduate of Basle who had been a professor since 1523 and who had performed the first recorded anatomical dissection in 1531, at the time when the University was officially closed. The other was Sebastian Sinckeler who had been appointed to the *cathedra theorica* in 1534. Instruction was given to students of medicine not only by their own professors but also by members of the Faculty of Arts. It must be remembered that those were not days of narrow specialism. Thus Johannes Oporinus, besides being a printer, had studied medicine and chemistry with Paracelsus and had been professor of Greek at the University from 1532 to 1539. Hieronymus Gemusaeus was from 1537 on *professor physices* in the Faculty of Arts, but being a very able mathematician and physician, he also gave courses to students of medicine. And so did Albanus Torinus who became a close friend of Vesalius.

*

The German name of Albanus Torinus was Alban zum Thor, or Alban Thorer. The surname was apparently derived from a family residence located at the city gate. He was born in Winterthur, a town in the vicinity of Zurich, in 1489. Little is known about his early life. He was a student of arts at the University of Basle in 1516 and graduated as *magister artium* in 1522,[9] whereupon he was a teacher at the St. Peter School. He obviously remained in close touch with the University, and from 1524 on he gave courses in the Faculty of Arts where he eventually became Professor of Latin. At the same time he studied medicine. In the summer of 1527 he was a

[8] *Ibid.*, p. 35.

[9] *Ibid.*, pp. 38 ff.

student of Paracelsus whereupon he went to Montpellier,[10] and it seems very probable that he took his medical degree in that university.

Thereafter Torinus led in Basle the active life that so many humanists were leading, practising medicine, teaching at the University, and editing and translating a great many medical classics. He must have been a good doctor, because he was soon physician-in-ordinary to the Margrave of Baden and to the Duke of Württemberg. As a matter of fact, his court practice became so absorbing that it ultimately wrecked his academic career. The professors were required to obtain a leave of absence before interrupting their courses, and when in the autumn of 1545 Torinus suddenly left town for a consultation, without leave, the City Council dismissed him.

Those were the glorious times when new Greek and Latin manuscripts were found almost every day and printers were only too eager to publish new editions of the classical writers. Like Winter of Andernach, Leonhard Fuchs and so many other humanist physicians, Torinus became a very productive editor and translator. His major works were the following:

1. *De re medica huic volumini insunt*, Sorani *Ephesii Peripatetici in artem medendi Isagoge hactenus non visa.* Oribasii *Sardiani fragmentum de victus ratione, quolibet anni tempore utili, antea nunquam aeditum.* C. Plinii Secundi *de re medica libri V accuratius recogniti et, nothis ac pseudoepigraphis semotis, ab innumeris mendarum millibus fide vetustissimi codicis repurgati.* Lc. Apuleji *Madaurensis, philosophi Platonici, de herbarum virtutibus historia. Accessit his Libellus utilissimus de Betonica, quem quidam* Antonio Musae, *nonnulli* Lc. Apulejo *adscribendum autumant, nuper excusus. Praeterea rerum et verborum locupletissimus Index. Basileae, 1528, in aedibus And. Cratandri.*

I have given the full title on purpose because it shows that such titles were regular announcements in which the editor stated what

[10] In the preface to his edition of Apicius, dated March 11, 1541, Torinus tells how he found a manuscript of the text in Maguelone *quum bis senis ab hinc annis multa Monspessuli, praesertim quae ad rem medicam attinent curiose agerem, et accuratissime observarem . . .*

he had done, whether a text was " not seen heretofore " or " never edited before," or whether it was more accurately presented and corrected on the basis of a very old manuscript. The *Albani Torini Collectio* as Choulant calls it,[11] is probably more important today than it was in the 16th century because the texts it contains do not represent a high type of medicine but are important documents of early mediaeval medical literature. A comparison of these editions with manuscripts [12] shows that Torinus, like many of his colleagues, was a somewhat arbitrary editor, for obvious reasons. He did not edit these texts for historians of medicine but for practitioners, and therefore did not hesitate to correct the texts whenever they seemed dark or wrong.

2. *DD. Joachimi Schilleri ab Herderen, physici, de peste britannica commentariolus vere aureus. Ad haec Alexandri Benedicti, Veronensis, recentiorum medicorum facile principis, de observatione in pestilentia libellus, plus in recessu certe quam fronte promittens, a mendis innumeris tandem vindicatus. Basileae, 1531, excud. H. Petrus.*

J. Schiller was at that time a young physician in Basle whom Torinus held in high esteem.[13] He had observed an epidemic of *Sudor Anglicus*, and since his treatise was short the publisher added to it a new edition revised by Torinus of Alessandro Benedetti's treatise on the plague, first published in 1493.[14]

3. *Pauli Aeginetae medici insignis opus divinum quo vir ille vastissimum totius artis oceanum, Laconica brevitate, sensibus argutis, merisque aphorismis in epitomen redegit. Albano Torino Vitodurensi interprete. Basileae, 1532, per Andr. Cratandrum et J. Bebelium.*

The first Greek edition of Paulus had been published by the Aldi

[11] *Handbuch der Bücherkunde für die ältere Medicin*, Leipzig, 1841, p. 405.

[12] See *Antonii Musae de herba vettonica* . . . ed. E. Howald et H. E. Sigerist, Leipzig and Berlin, 1927, p. xv.

[13] Insigni cum ratione, tum experimentis medicinae doctor, *Epist. dedicat. Alex. Benedicti.*

[14] Schiller's treatise was reprinted in Gruner and Haeser's *Scriptores de sudore Anglico*, Jenae, 1847, p. 273 ff.

in Venice in 1528 and both Torinus and Winter of Andernach set out to translate it into Latin. Both translations appeared the same year, in 1532, but Winter's translation was complete and was made not only from the printed edition but also from manuscripts. In Torinus' edition Book VI on Surgery was missing. It was translated by J. Bernardus Felicianus and was published by the Giunta in Venice in 1532 with a reprint of Torinus' version:

> *De medica materia libri septem, totius fere artis medicae breviarium. Quinque quidem primi septimusque Albano Torino Vitodurensi interprete. Sextus vero de chirurgia quem Germani non sunt interpretati, a Joanne Bernardo Feliciano nunc primum Latinitate donatus.*

Whereupon Torinus added notes to the translation of Book VI by Felicianus and had it published by Cratander in Basle in 1533. A new, this time complete edition was issued by Balthazar Lasius in Basle in 1538, and Oporinus published the Torinus version twice in 1546 and 1551.

4. *Paraphrases in libros omnes Alexandri Tralliani. De singularum corporis partium, ab hominis coronide ad imum usque calcaneum vitiis, aegritudinibus et iniuriis, libri ad unguem facti V. Per Albanum Torinum Vitodurensem recens latinitate donati. Basileae, 1533, H. Petrus.*

A Greek edition of Alexander Trallianus was not published before 1548, and Torinus' very free paraphrase was based mostly on Latin manuscripts. The second somewhat revised edition was published in Basle, 1541, to which was added:

> *Dioclis Carystii principis secundum Hipp. rationalis medici, de tuenda sanitate ad Antigonum regem, libellus vere aureus.*

5. *Philareti de pulsuum scientia libellus utilis et necessarius. Item Theophili de exacta retrimentorum vesicae cognitione, commentariolus . . . Albano Torino interprete. Basileae, 1533, H. Petrus.*

An earlier translation of the Liber urinarum Theophili was incor-

porated into the Articella. Torinus' edition was the first modern Latin edition of the two treatises. According to Choulant [15] it was reprinted in Strassburg in 1535 and was included into the collection of Stephanus *Medicae artis principes*, Paris, 1567.

6. According to Reinesius, *Epistolae ad Daumium*, Jenae, 1670, p. 95, Torinus published in Basle, 1538, an edition of the *Liber medicinae ex animalibus* of Sextus Placitus. The edition seems to be extremely rare because neither Choulant nor any of the more recent bibliographers seems to have seen it.

7. *Wie man sich vor der grusamen, erschrocklichen krankheit der Pestilentz enthalten unnd denen so domit beladen, wider helffen mög. Durch Albanum zům Thor, der fryhen Künsten unnd Artzny Doctor. Basel, 1539.*

Basle was hit in 1539 by a local outbreak of the plague and Torinus, who not only knew the literature on the plague but had had much practical experience with it, wrote in a week's time this treatise in which he advised the people and the authorities on how to deal with the disease.

8. *Caelii Apitii, summi adulatricis medicinae artificis, de re culinaria libri decem. B. Platinae Cremonensis de tuenda valetudine, natura rerum, et popinae scientia libri X. Pauli Aeginetae de facultatibus alimentorum tractatus, Albano Torino interprete. Lugduni, 1541, apud Seb. Gryphium.*

The book also contains (pp. 100-105) *Appendicula de condituris variis, ex Ioanne Damasceno, Albano Torino paraphraste.*

Apicius' book had been printed several times before. Torinus based his edition on two manuscripts and the Venice edition of 1504, but again he proceeded very arbitrarily: "edidimus tandem . . . plerisque mendis, nostra opera satis tumultuaria, nullo saepe suffragante exemplari, sublatis, adeo ut citra offensam, sineque taedio a studiosis omnibus et legi, et maxima ex parte intelligi possit." [16] The edition of Hummelberg published in Zurich in 1542 is much more reliable.

[15] *L. c.*, p. 140.
[16] *Epist. dedicat.*, p. 6.

9. *Jani Damasceni decapolitani therapeuticae methodi, hoc est, curandi artis libri vii, partim Albano Torino Vitodurano paraphraste, partim Gerardo iatro cremonense metaphraste. Basileae, 1543, H. Petrus.*

Yahya ibn Sarafyun or Serapion the Elder was born in Damascus, hence Torinus called him Janus Damascenus whereby he created much confusion since Mesue the Elder was also called in various printed editions Johannes or Janus Damascenus.

■

In 1543, when Vesalius arrived in Basle, Torinus was at the height of his career. Physician to several courts, a well known humanist writer, he was in addition Rector of the University for the year 1542 to 1543. As such it was his official duty to welcome the distinguished visitor, a duty which he undoubtedly gladly performed since he had many interests in common with him.

In 1537 Vesalius had published his *Paraphrasis in nonum librum Rhazae*, the second edition of which had been printed in Basle the same year by Robert Winter, a relative of Oporinus. In 1543 Torinus was preparing a new edition of the works of Rhazes. The translation of Gerard of Cremona, like most 13th century translations from the Arabic, was in atrocious Latin, and the humanists without knowing the Arabic language endeavored to interpret these texts by rewriting them in good Latin. This had been the purpose of Vesalius' "Paraphrase," and this is what Torinus intended to do on a larger scale. He incorporated Vesalius' early work into his edition of Rhazes that was published in 1544 by Heinrich Petri in Basle under the lengthy title:

> *Abubetri Rhazae Maomethi, ob usum experientiamque multiplicem, et ob certissimas ex demonstrationibus logicis indicationes, ad omnes praeter naturam affectus, atque etiam propter remediorum uberrimam materiam, summi medici opera exquisitiora, quibus nihil utilius ad actus practicos extat, omnia enim penitus quae habet aut Hippocrates obscuriora, aut Galenus fusiora, fidelissime doctissimeque exponit, et in lucem profert. Per Gerardum Toletanum medicum Cremonensem,*

Andream Vesalium Bruxellensem, Albanum Torinum Vitoduranum, latinitate donata, ac iam primum quam castigatissime ad vetustum codicem summo studio collata et restaurata, sic ut a medicinae candidatis intelligi possint. Quibus nihil prorsus salutarius in miserorum mortalium usum, adversus tot morborum species, conferri potuit. Basileae, 1544, in officina Henrichi Petri.

Without being an anatomist Torinus was fully aware of the significance of Vesalius' work. The execution of a criminal gave an opportunity to invite Vesalius to demonstrate his anatomical methods. The dissection took place on May 12 and we can well imagine that faculty and students must have watched it with breathless attention. Vesalius mounted the skeleton and presented it to the University where it is still preserved.

During those months of 1543 Vesalius must have been very busy with the supervision of the printing of his books. He was anxious to see them published and there are many symptoms indicating that the job was rushed. But finally it was completed, and in June both the *Fabrica* and *Epitome* came from the press. Two months later, on August 9, Oporinus completed the printing of a German translation of the *Epitome* by Albanus Torinus. Vesalius was still in town for we know that on August 3 he was godfather to a child of Robert Winter.[17]

The German translation of the *Epitome* must have been Vesalius' own idea. It is well known how bitterly he resented the plagiarisms committed with his *Tabulae Sex*. A book addressed to a large audience such as the *Epitome* would undoubtedly be translated into German very soon, under conditions beyond the author's control. It was therefore preferable to have the translation made by a friend with whom he could consult, and to have it printed by his own printer with the plates made from the original blocks.

The fact that Vesalius remained in Basle until the German *Epitome* was published, shows that he took a great interest in this edition also.

[17] See Roth, *l. c.*, p. 129.

The German *Epitome* was published under the title: [18]

> *Von des menschen cörpers Anatomey, ein kurtzer aber vast nützer ausszug, auss D. Andree Vesalii von Brussel bücheren, von ihm selbs inn Latein beschriben, unnd durch D. Albanum Torinum verdolmetscht.*

In the "Address to the reader" at the bottom of the title-page reference is made to the fact that the German edition has more illustrations than the Latin original "for the benefit of the common man":

> *Seind aber weyter an vil orten mehr figuren, wellche imm Latein nitt begriffen, har in das Teütsch Compendium, dem gmeinen man zů gůt, gesetzt worden.*

Torinus translated Vesalius' dedication to Philip and added his own dedication, addressed to the Duke of Württemberg whose physician he was. The first half of it is one of these nauseating pieces of adulation customary at the time, but offensive when they come from the pen of a Swiss writer. The second half is more interesting and deserves to be translated into English:

"There is great expectation that Your Highness will revenge the healing art throughout his realm and will expell those Aesopian crows, those ignorant inexperienced pseudo-doctors [19] who without possessing any skill violate the divine art of medicine and wickedly deceive everybody—so that nobody may practise medicine unless he has passed the regular tests and has proved to possess the skill and experience required of learned physicians, just as it is the custom in other crafts. In all well regulated cities no saddlemaker, no shoemaker, no artisan of any kind may practise his craft before he has been duly approved by the masters of the same craft. But the most ignorant, most desperate rascals have the liberty to practise the holy art of medicine. What times, what ways and customs! Are we so bewitched and so insane that a saddle, a shoe and other objects that only serve to protect the body should be more highly esteemed than

[18] For a full description of the book see Cushing, *l. c.*, pp. 113 ff.
[19] Kelberarzt, literally calf-doctors.

the body itself? And since anatomy is the right beginning and the foundation of all medicine, without which nothing can be constructed or if it has been constructed collapses, we have for the benefit of the whole German nation, not without labor, most faithfully translated into the German language this most useful compendium of the story of the human body [20] by Dr. Andreas Vesalius of Brussels who is well versed in many arts, and in Hippocratic and Galenic medicine, and has great merits, and there has never been anyone like him in the dissecting of man and other animals. In this book you see as in a mirror all bones, cartilages, ligaments, intestines, muscles, veins, arteries, nerves, membranes and such things, where and how they lie, what color they have, what form, what substance, how large they are, in what order, how soft, how hard, how rough, how smooth they are, what growths they have etc. All this is put very briefly, yet without gaps, not hard to understand; almost all that Galen has spread lengthily over twenty-seven books is properly told in one summary, and this in many ways more diligently and more perfectly as those will readily realize who look at the structure of animals and men seriously, assiduously and critically. Such anatomy, however, is not only highly necessary for the physicians and the lovers of learning; it is appropriate, useful and pleasant for all people to have knowledge of it. The fact that in the past emperors and kings have devoted much attention to it, is attested by Alexander the Great and Mark Anthony, the best emperor, according to the historians' writings. Not to mention the kings of Egypt who with their own hands cut open animals and men in order diligently to view and contemplate the wisdom of the supreme artificer, his marvellous and divine work, a temporal abode and carriage of the soul (as Plato called it). For these reasons I am sending this small tribute to Your Highness. When you read it, and look at it in moments when you are less burdened by government business or in furtive hours, you will see how high man stands above all animals, how he has been created after God's image, and what inexpressible dignity the soul, therefore, assumes which has its abode in such an ingenious and more than diligently built palace; and you may then seriously consider by what means and art such structures may be administered and preserved

[20] Von des menschen cörpers history.

for a long time. I, therefore, humbly request Your Highness graciously to accept this dedication and small tribute (with which I wish to express my sentiments, diligence and good will), and recommending myself in all humility I beg you to keep me in your graces. Given at Basle, on the fifth day of August, in the year of our Lord MDXLIII."

The humanist physicians were as a rule not very keen on translating scientific texts into vernacular languages. This was not so much a matter of conceit, as rather because of the difficulty of the task. It was relatively easy to translate a treatise from Latin into Italian, Spanish or French, and all these languages have been greatly enriched as a result of translations that introduced many new terms. A translation into English was more difficult, but since the English language had many words of Latin origin it was always possible to accept new Latin terms in anglicized form. The translation of a scientific text into German, however, was in the 16th century an extremely difficult task.

It is well known how Paracelsus struggled with the German language, but he at least was thinking in German, and when the language had no term that expressed his thought, he made one, or borrowed one from some other language. A translator like Torinus had to express in German what had been conceived in Latin. He could not take over technical terms but had to translate them. *Musculus* literally means *little mouse*. The French and English translators did not have to worry since the term had already been accepted and had become *muscle* in both languages. The Germans, however, had to translate, and *musculus* was rendered as *mäuslein*. What enormous difficulties Torinus had to overcome in translating the *Epitome* becomes easily apparent when we compare the Latin text of the first sentence of the book with the German version. The Latin text is concise, simple, and as clear as crystal:

Omnes humani corporis partes sunt aut similares, sensuve simplices, ut os, cartilago, ligamentum, fibrae, membrana, caro, adeps: aut dissimilares, instrumentariaeve, quemadmodum vena, arteria, nervus, musculus, digitus, et reliqua totius corporis organa: quae eo magis instrumentaria fiunt, quo pluribus similaribus, ac dein instrumentariis etiam partibus (ut manus et caput) componuntur.

Torinus' version of the sentence reads:

Ist mengcklichem zewissen, das alle glider und sundere stück darauss des menschen leyb geschaffen, seind eyndtweders auss denen, go gleichling, oder einlich (das ist, welliche so sie zertheylt inn vil stück werdent, seind alle theyl unnd jeglichs inn sunderheyt jhe eines dem anderen nit ungleich, unnd behalten den nammen des gantzen) genant werden, als da seind beyn, krössbeyn oder knorbel, bandtrhiemen, ziserle wie äderle, welliche wie ein faden inn wuppes weyss zerspreit, helffen etliche glider aussmachen, von den Lateynischen *fibrae* genant, permentshaut, fleysch, feysste und schmaltz: Oder ungleichling, damitt man schafft und etwas übet, wellche zertheylt, jhnen selbs ungleich seind, jhren nammen verlieren, als da seind, blutaderen, pulsaderen, sennen, oder nerven, meüsslin, finger, unnd alle anderen instrumenten des leybs, welche so vil mer zu eynem rüstgeschirr tuglich werden, so sie auss mehr gleichlingen, unnd auch zu der übung tuglichen (als handt und haupt) gemacht und geschaffen seind.

The Latin *partes sunt aut similares, sensuve simplices* was unmistakably clear. But when Torinus rendered it by *seind eyndtweders auss denen so gleichling oder einlich . . . genant werden*, he felt that the translation was anything but clear, particularly since it was addressed not to specialists who were familiar with Galen, but to laymen. He, therefore, added in brackets a whole sentence in order to explain the meaning of *similares: gleichling* and *simplices: einlich*, in which he said "that is (parts) which when they are divided into many pieces, all parts and every one in particular, are not different from one another and they keep the name of the whole." Now the translation was clear.

When it came to rendering anatomical terms into German, there was no difficulty with *os, cartilago, caro, adeps*. The corresponding words for bone, cartilage, meat, fat were kitchen terms. *Ligamentum* could be translated as *bandtrhiemen*, strap, a word that conveyed a visual idea. But there was no generally accepted German word for

fibra and Torinus again had to explain what this part was like: "ziserle,[21] like tiny blood-vessels which spread like a thread in a fabric, help constitute some members," and then he adds "called fibrae by the Latins." And again in translating *dissimilares instrumentariaeve* he feels that he must explain in what way these parts are dissimilar, namely "when taken apart (the constituents) are unlike one another and lose their (common) name."

The examples could be multiplied indefinitely, but this one is sufficient to demonstrate what a difficult task Torinus had undertaken. It also shows that his version is more than a literal translation, that it is a regular interpretation.

Few anatomical texts had been written in German before 1543. Joseph Hyrtl in his classical monograph on the old German anatomical nomenclature lists only nine,[22] and although his list is certainly not complete, there is no doubt that their number was not large. Some were mere fugitive sheets, others short anatomical texts added to surgical books (Brunschwig and Gerssdorff). Jobst de Necker had plagiarized Vesalius' *Tabulae Sex* and had published them in 1539 with a German text, and Walter Ryff had done the same in 1541. In translating the *Epitome* Torinus did pioneering work.

■

The seven months spent in Basle were a pleasant interlude in Vesalius' career. It was perhaps the most carefree period of his life. When he arrived in January 1543, he came with the knowledge that he had completed his great work, that should he die young he would not have lived in vain. He moved in a cultured atmosphere with men who shared his interests and with whom he could discuss everything under the sun. And from day to day he could watch his books taking shape.

He saw the cherry trees bloom, filling the valleys with joyful exuberance, saw the hills become covered with tender green, and

[21] The word was commonly used to designate the threadlike roots of plants.

[22] Joseph Hyrtl, *Die alten deutschen Kunstworte der Anatomie*, Wien, 1884, p. xi ff.

when he left in August his three books had come from the press and had begun their course through the centuries. He left the town for a future that was uncertain and was to be filled with disappointments and bitterness.

In translating the *Epitome* Torinus created the work for which he is chiefly remembered today. In 1544 he published his edition of Rhazes in which his name is linked up with that of Vesalius. It was his last major literary work. After this he became more and more involved in medical practice, and he died in January 1550.

THE AMUSCAN ILLUSTRATIONS *

A. W. MEYER AND SHELDON K. WIRT

The Anatomy of Juan de Valverde [1] appeared in almost a dozen editions in four different languages—Spanish, Italian, Latin and Dutch. The first edition in Spanish, of 1556, and the second edition in Italian, of 1586 [2] were mainly used in this study, but the 1560 edition was compared with these two without finding any notable differences in regard to the things considered here. Every illustration in the editions of 1558 and 1586 was scrutinized in detail and compared with the corresponding Vesalian figure as found in the Fabrica of 1543 or 1555. The differences were tabulated but the publication of such a detailed analysis seems quite superfluous in order to confirm easily the source of almost all of Valverde's illustrations.

A comparison of the Valverdean [3] with the Vesalian illustrations is complicated considerably by the complete reversal of most of the Vesalian illustrations obviously during their reproduction; by the partial reversal of others, and by the absence of reversal of some. It is further made difficult by differences in grouping of the illustrations, changes in posture and in location, and especially by the unnecessary and meaningless omission and substitution of parts of the body, such as heads, limbs and genitalia. There also are differences in the accessories, in the background and in the numbering

* We are greatly indebted to the Army Medical Library for a microfilm of the first edition of Valverde's Anatomy and to the University of California Medical School for use of a 1560 edition.

[1] Juan de Valverde frequently was spoken of as Amusco, Hamusco, and Huescanus and Valverde de Hamusco. His Christian name likewise appears in different forms in different languages and also in archaic forms.

[2] According to Garcia (1921) page 110 "the oldest and most complete edition of his work appeared in Spain in 1556, but the edition best known in Europe was published in Venice in 1586." Since the Italian edition contains Valverde's illustrations and some text not in the 1556 Spanish edition we do not understand the reason for calling the latter "the most complete."

[3] For the purpose of convenience we are not using the names of the artists Calcar (Kalkar) and Becerra who made the drawings for Vesalius and Valverde respectively but speak of the Vesalian and Valverdean illustrations instead.

and lettering, but as a rule, the same letters are found in the same order and in the same location. Two of the Vesalian figures were encumbered by mail and hair was removed or added to others. Life-like, instead of cadaveric physiognomies, were substituted on some of the partially dissected torsos and minor alterations such as the omission of shadows and the provision of cross-hatching were made without mention, as a rule.

However, even a cursory examination of the originals should suffice to convince anyone that Valverde copied almost all of his illustrations out of the above-mentioned editions of the Fabrica, although we were unable to learn the source of most of the few non-Vesalian illustrations. They are found on the following plates in Valverde and include: (1) the famous muscle-man (Fig. 1 *) holding his own skin in the right and a dagger in the left hand (Fig. 1, Plate I, Book II); (2) four figures of the muscles of the eye (XX to XXIII incl., Table 15, Book 2); (3) a longitudinal section of the bladder, prostate, urethra and penis (Fig. XVIII, Pl. 16, Bk. 2); (4) a classical figure of Venus with open abdomen (Fig. XXX, Pl. 6, Bk. 3) and (5) a detached fetus in the lower right hand corner of this plate; (6) four figures (VII to X incl.) of the opened heart (Bk. III) and (7) two complete male figures showing the cutaneous veins (Figs. I and II, Pl. I, Bk. 6). This makes a total of fourteen to which one marginal illustration, a diagram, of the origin of the great vessels on page 87 may be added. Hence in a total of 253 Valverdean illustrations we find only fifteen that may be called non-Vesalian, though at least two, if not more, may be said to be after him. Moreover, Valverde does not claim originality for the famous muscle-man, and, in fact, leaves one with the impression that he claims that only for the four figures of the opened heart. It is well to recall that although the Fabrica of 1543 contains 379 anatomical illustrations, the four Valverdean figures of conceptuses and the lone fetus, accompanying the Venus including most of the lettering though not identical, very clearly were made after four illustrations (p. 586) in the Fabrica of 1555. Valverde hence used 239 out of a total of 383 Vesalian illustrations, though four addi-

* Because the microfilm of the 1556 edition of the Composicion lacked clearness in some places the needed illustrations were taken out of the Anatomia of 1586.

FIG. 1

The muscle-man holding his skin. Valverde, Pl. I, Bk. II, p. 64. Valverde's legend says the penis X is skinned! It was in the Fabrica.

tional plates of muscle-men were interpolated in the 1586 and apparently also in some other editions of Valverde's Anatomy. Choulant (1852) implied that these four figures first appeared in the Latin edition of 1589 issued by "Michael Columbo" the son of Realdus, the teacher of Valverde, and that neither the artist nor engraver are known. These four figures are found on four unnumbered leaves and are preceded by a leaf bearing the notation: "Besides the usual Valverdean figures we are adding the following four muscle figures. They are beautifully done, differ from the rest and are added to improve the volume. They are placed at the end of book two in order not to disturb the original order of the numbered figures."—Since these figures are unaccompanied by explanatory notes or legends they probably were not of much help to the students or others not anatomists by profession. Moreover, they, especially the second and fourth, are done rather crudely as compared to the Vesalian figures.

Roth, 1892, (p. 214) credited Valverde with six new figures: "Figs. 20 and 22, Tab. 15, Lib. II; Tab. 6, Lib. III. The pregnant woman whose external appearance reminds one of the nude figures in the Epitome and the seated fetus on the same plate; two representations of cutaneous veins, Tab. 6; Lib. I"—The latter reference evidently is a misprint and should read: Pl. I, Bk. VI, instead. Roth was mistaken in crediting Valverde with only two instead of four new figures on the eye, all of which are in a measure after Vesalius, however. In one (Fig. XXII, Tab. XV, Lib. II) Valverde represented the m. quintus oculi, (N) which he said Vesalius stated, helped to raise the eye. The latter, however, represented no muscle even remotely resembling what Valverde designated by N. Moreover, regardless of the orbicularis oculi (p. 238) seven ocular muscles are represented in the Fabrica, and Valverde combined the slightly altered Vesalian representation of the orbicularis with another Vesalian illustration (the second figure of p. 239) to produce his figure (XX, p. 80). It may be added that Vesalius' muscle (O) and the Valverdean muscle (B) (Fig. XX, p. 80) have no existence in fact, and that the Valverdean muscle (N) seems to have been suggested by the Vesalian muscle (H) (second figure, p. 239).

In extenuation of the first muscle-man, Valverde emphasized that

the direction of the fibers was indicated better on it than on the comparable Vesalian figure, but one can scarcely accept this statement because there is a great deal of cross-hatching on both sides of the body in the former and also exaggeration of the bellies of the muscle of the calf, and little improvement. This muscle-man appears in the same posture as that of Apollo in the painting by M. F. of 1536, as reproduced here (Fig. 2) after Holländer, 1913 (p. 13). In this painting the flayed Marsyas lies prone, however, and Apollo holds a knife, not a dagger in the left hand. Holländer says that the reversal in position obviously occurred during the reproduction of the copper plate of the monogrammist M. F., and cautioned in a footnote that the date, 1536, may not be reliable. He felt, however, that it seemed as though the artist (M. F.) who drew this picture of Apollo had the sheet of Domenico (Barbiere) Fiorentino (an engraver) of the year 1506 as an anatomical basis for his work. The latter's figures are reproduced here (Fig. 3) after Choulant, 1852 (p. 17). One wears a laurel wreath and both have life-like visages. Choulant, however, thought that the muscle-man of Valverde supporting his skin, may have been introduced after Mondeville whose figure bore the skin on a stick over the shoulder. Pankow (1898) rendered the legend accompanying this figure as follows: "Figure 4 represents a human being, who was skinned, and carries his skin on a stick over his shoulder. One sees the scalp covered with hair, the skin of hands and feet'" etc.

Cushing (1935 and 1938) called attention to a statue in Milan Cathedral, an écorché, of Marco Agrate, ". . . wearing his skin over his shoulder like a much-needed tippet" and also to Michaelangelo's Last Judgment, of 1541, which ". . . shows the saint (Bartholomeo) sitting at the feet of Jehovah with brandished knife, the instrument of martyrdom, in one hand, the pendant skin in the other." Cushing surmised that ". . . it may well be that Valverde's artist, Becerra, was at work there and that his inspiration was drawn from his master's recently finished fresco over the altar of the Sistine Chapel."

Why Becerra on his own initiative or, perhaps, on instructions from Valverde, substituted a dagger for a knife is hard to understand since the flaying plainly could not have been done with the

FIG. 2
Apollo flaying Marsyas. Holländer, p. 13.

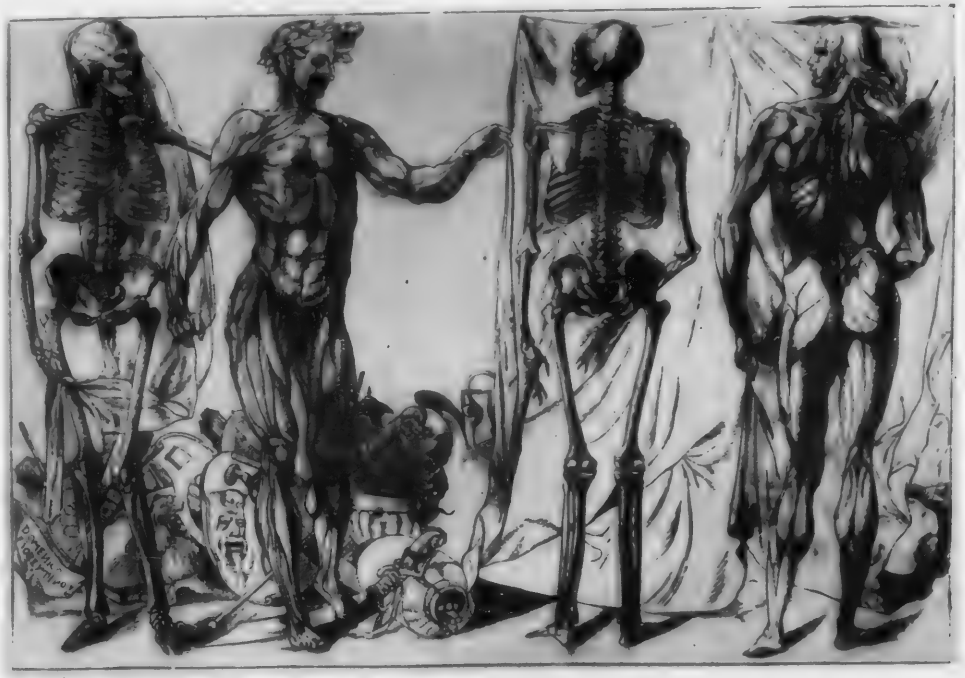


FIG. 3

The muscle-men of Rosso de' Rossi (1496-1541) with accompanying skeletons. A copper plate by Domenico Barbiere (Fiorentino) after Choulant, 1852, p. 17.

former and a dagger is not included among the anatomist's armamentarium (Fig. XX, Pl. 3, Bk. 5, Valverde) taken from the Fabrica (p. 235, 1543). It seems very significant that in the introduction to this plate Valverde himself merely said that the figure is different from that of Vesalius in that the shading indicates the direction of the muscle fibers better, claiming no originality for it.

The lifelike figure of a somewhat dolorous, pensive, pregnant female, (Fig. XXX) with the abdomen opened by a crucial incision and with reflected walls, exposing a nodular uterus and the urinary bladder (fused), is done in the style of classical art, after the manner of the Venuses or perhaps better, of an Aphrodite, but it has truly surprising feet, anatomically and artistically. Since nudes were included among the Vesalian plates in the Epitome and since similar figures, in the nude, were so current, and occur also in far earlier art, the introduction of this female figure by Valverde cannot be regarded as an innovation deserving special commendation. Moreover, it adds nothing of anatomical knowledge, for it merely shows a near full-term, somewhat nodular pregnant uterus within the abdomen. Reichert and Mathes, 1942, regarded it as " . . . demonstrating her gravid uterus with foetus and placenta in the background."

The most surprising thing in Valverde—as also in Vesalius—is the figure of the uterus (Fig. XXVIII, Pl. 6, Bk. 4 in the former). As the accompanying illustrations (Figs. 4 a and b) reveal, Valverde reversed the sectioned body of the " uterus " and indicated a cervical canal by lines. I think readers will agree that in spite of the Valverdean reversal of a portion of the Vesalian figure, it remains grotesque because of the strange pudenda. We are at a loss to suggest why it happened to be drawn thus and had not been recognized as grossly inaccurate by Valverde's teacher Colombo or by his patron and undoubtedly also his mentor, Eustachi, or by Valverde himself. The most engaging thing about this incongruous figure is the last item in the legends in both Vesalius and Valverde. That in the latter differs slightly and reads: " The rest of this figure, without letters, anyone can easily understand." To anatomists and no doubt to gynecologists and obstetricians as well, it remains a puzzle upon which knowledge of Calcar's personality might shed some light. It is, of course, not surprising that Vesalius—and Val-

a. b.

FIG. 4

The uterus (a) after Vesalius (p. 481) and (b) after Valverde (Fig. XXVIIII, Pl. V, Bk. III, p. 100). The Vesalian I, I, I, became III in Valverde's legend.

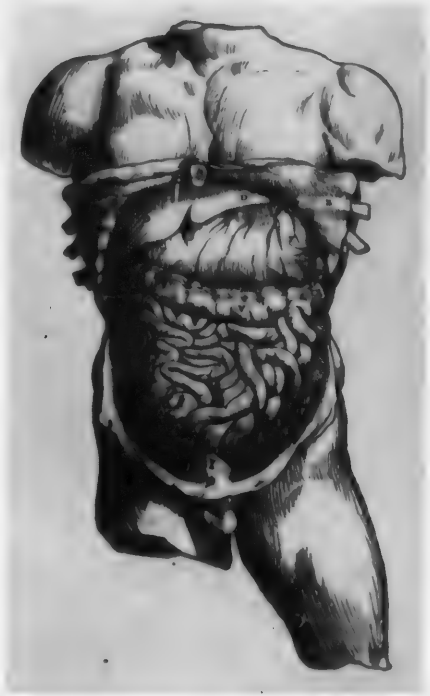
verde as apparently also his teacher Colombo and patron Eustachi--regarded the vagina as part of the uterus, but it is surprising that Vesalius and Valverde should have said that the neck of the bladder (L) joins the neck of the uterus (the vagina) and that the nature of the rest—the peripheral part—is self-evident. From an accompanying smaller figure in the Fabrica, it is undoubted that what, aside from hair, looks like a typical glans in the above figure of the uterus, is supposed to represent the labia!

There is no doubt that Valverde was acquainted with some errors in the Fabrica and took pains to call attention to them in the legends but, as Roth (1892) emphasized, not in the text. Had he not noticed errors from his own dissections, he could not well have studied under Colombo who is said to have been unfriendly to Vesalius, or lived with Eustachi without acquiring this knowledge. However, we did not get the impression expressed by Haeser (1881) that Valverde's work was especially designed to reveal the errors of Vesalius, and, for our purpose, it does not matter much whether he was an anatomist by profession. Although Choulant emphasized that Valverde was not an anatomist, the Spanish historians Garcia and Morejón give an opposite impression and the latter even emphasized that Valverde's illustrations represent the actual, because made from observations at autopsies! Choulant (1852), on the contrary, said that the Vesalian illustrations were most exhaustively plagiarized in the oft-reprinted and revised work of the Spaniard Valverde de Hamusco, and in the Bibliotheca Osleriana (1929) it is stated somewhat similarly that "Nearly all the plates are copied from Vesalius and Valverde's text is plagiarized from the Fabrica." This also was the conclusion of Roth.

Garrison (1929) merely said that the Vesalian figures were copied or imitated by a long line of illustrators, mentioning Valverde among them. This estimate by Garrison recalls that Sprengel (Vol. 4, p. 13) said that: "Among the authors who also have contributed to the progress of anatomy, but who present less of interest, and are mostly compilers, or plain copyists, I give first place to Jean Valverde de Hamusco, the Spaniard, whose work, which was translated into Italian, ought to be considered, with some changes, as a plain extract from Vesalius."

In the *Biographie médicale* (Vol. VII), R. Desgenettes said Valverde made no discoveries but deserves credit for having spread an interest in anatomy and facilitated its study upon his return to Spain. The last is also what Wunderlich (1859) said. Desgenettes (p. 397) quoted from one whom he called the chief writer on Valverde "... a historian of anatomy and surgery" who held that: "The work of anatomy of Valverde is almost the same as that of Vesalius; he has added some non-essential remarks and he has added some plates engraved upon copper, which are more beautiful to look at, without adding to accuracy: on the contrary in several respects Valverde robbed them of their exactitude by complicating them with objects strange to anatomy. Thus one finds cadavers with cuirass, shield and sword,—very strange ornaments for the art." He added that in the edition which Colombo, the younger, edited in 1607, four plates on the muscles were added which were inferior to the beautiful plates of Vesalius on the same subject, and concluded by saying: "Among the different descriptions taken from the work of Vesalius one finds the principal objection which Colombo made to this author. Valverde has only combined one thing with another."

Morejón (p. 379) said that Desgenettes did not see Valverde's work and that what he said was derived on good faith, from some countrymen of his who likewise was unfamiliar with the work. He rightly insisted that there is not a single plate representing a cadaver with shield, mail and sword, but two Valverdean illustrations (V and VIII) reproduced in the accompanying figure (5 c.) with Vesalian equivalents (Fig. 5 a and b), bear an abundance of mail! Why dissected torsos should be clothed in armor remains one of the things that both amuses and puzzles for it certainly added nothing to anatomical knowledge and did not evidence allegiance to the Master. Moreover, it apparently is such gross masking as this and other changes unmentioned by Valverde that misled Choulant into regarding Pl. I, Bk. II, Figs. 1 to 3 and 6, Bk. III and Pl. I, Bk. VI, as non-Vesalian illustrations. It may also be responsible for the publication of 29 Valverdean illustrations, among 36, by Reichert and Mathes, apparently without recognition that they were of Vesalian origin. In order to reveal this Valverdean masking further, we are reproducing illustrations (Figs. 6 a and b; 7 a, b, and



a.

b.

FIG. 5

Two torsos (a and b) from the Fabrica (pp. 460 and 463) and the mailed counterparts (c) from Valverde (Figs. V and VIIII, Pl. II, Bk. III, p. 95. Valverde's figure V has an added S without legend.

without legend.

a. b.

FIG. 6

Torso (a) from Vesalius (1543, p. 456) and the same (b) wit ha living visage, chest, and arms from Valverde (Fig. II, Pl. 1, Bk. III, p. 94). Note the duplicated A and B on the shoulders.

c), from Valverde, with the originals from the Fabrica. Careful scrutiny of these surely can leave no one in doubt and we hence omit further comment.

It is significant that in his dedication to the Archbishop of Santiago, Valverde gave his reasons for writing his anatomy and said that Vesalius surpassed all those who wrote before him and was endowed by God to write his work, in order to return to the world an important and neglected part of medicine. He further declared that whatever advantage was derived from his book was due *equally* (!) to Vesalius, to his preceptor Columbo and to the aid and protection of his benefactor, the Archbishop. In his remarks "To the reader" (p. 5) he said that some of his friends felt that he should make new drawings and not use those of Vesalius, but that he decided not to do so and consequently escaped the confusion which might have arisen since readers would not have been able to discern in what respect he and Vesalius disagreed. He added that the Vesalian figures were made in such a manner that it might seem to be envy or jealousy on his part not to avail himself of them, but thought that it would be as easy to improve, as it would be difficult to ignore, them and make better figures of his own! The latter idea is contradicted by conclusive evidence in the few original illustrations of his own work.

In view of the above statements concerning Vesalius, it may seem strange to some, perhaps, that a charge of plagiarism ever should have arisen and that it has persisted to this day. García (p. 111) said Valverde complained to Philip II, to whom he dedicated his Italian edition, that although he had published in Spanish, he had been criticized for doing nothing more than translate the work of Vesalius. In order to clear his reputation and prove the falseness of this criticism, he had decided to translate the Spanish work into Italian. Unfortunately, however, this venture did not accomplish his purpose and it is easy to see why not, for Valverde kept silent about the falsification of so many of the Vesalian illustrations saying nothing about the substitution or omission of parts, the addition of others, of changes in posture, needless and misleading dislocation of illustrations on a plate, addition of armor; the replacement of dead visages by living ones, even on dissected torsos—or

of many other things. Moreover, the changes which he mentioned in his explanatory notes, were in the order of criticisms and he even claimed that his first figure of the skeleton displaced one poorly done in the Fabrica, although a mere glance suffices to show that the Valverdean figure is faulty in several respects.

In a footnote Vallin (1893) declared: "This work (the Composición of Valverde) according to Hermán de Morejón, surpasses and is preferable with respect to many conceptions to the very celebrated one of Andrés (sic) Vesalio. . . ." But a writer in the *Biographische Lexikon*, 1884, who referred to volume one of the *Biographie Médicale*, on the contrary, regarded Valverde's anatomy as overwhelmingly Vesalian and even García, 1921, (p. 115) emphasized that he does ". . . not wish to imply that Valverde is superior to Vesalius" but Morejón, 1842, (p. 380), on the contrary, asserted what Vallin said, probably upon the opinion of Chinchilla (1841), who García says thought Valverde's illustrations "greatly surpassed those of Vesalius in worth and beauty" . . ." as anyone who will take the trouble to compare them can easily appreciate." (!)

Chinchilla, too, apparently remained unaware that all but a few Valverdean illustrations actually are Vesalian and he also may have been over-impressed by the finer texture of the copper plates as compared to woodcuts, or like some others, was fascinated by Valverde's grotesquery, which as Roth rightly emphasized, debased the originals. The latter (p. 255) thought that: "Like all plagiarists Valverde took as much as he could." Chinchilla (p. 244), on the other hand, protested that Valverde's work was not an abbreviation of that of Vesalius and held (p. 245) that Desgenettes' opinion was based on "Eloy's Diccionario de medicina." Chinchilla may be correct in regard to Desgenettes, but his judgment can not be relied on for he approvingly quoted (p. 158, Vol. I) Morejón to the effect: "That the discovery of the circulation of the blood attributed to Harvey belongs exclusively to Spanish doctors as they announced it in 1535, 1542 and 1549, but especially to the celebrated Michael Servet, to whom no one can deny the glory of this discovery. (Decadas med. tomo 1, page 30.)"

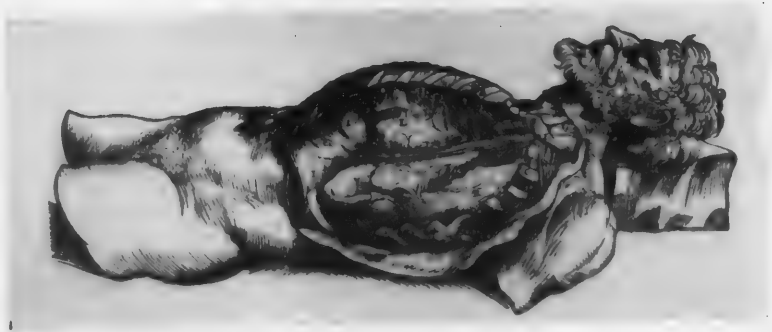
Ball (1897) said that: "Although Valverde claims to have taken

his illustrations from Vesalius, yet his book contains many plates not found in the writings of the great reformer." However, Ball listed no such plates nor presented any evidence, and apparently also was misled by the Valverdean changes in Vesalian figures. If we omit the muscle-man which Valverde does not claim as being original, then only one entire plate (Pl. I, Bk. 6), that containing two male figures showing the superficial veins, is non-Vesalian, for the other thirteen figures we regard as non-Vesalian are interspersed among other Vesalian figures on various plates. Even the female figure referred to above is accompanied by five smaller figures, at least four of which are after Vesalius, and since Valverde himself claims no originality for any other figures than the four of the opened heart, it may well be that the other non-Vesalian figures are from a source or sources which are unknown to us, the writers.

It seems questionable that Valverde's influence on Spanish anatomy can have been as large as sometimes asserted and even Morejón says that he misstated, or misapprehended, the true status of anatomy in Spain and was wrong in assuming that it was repugnant to the Spanish to take dead bodies apart. This also is suggested, if as Ball said: "In 1550 an ordinance was published directing that, in all the schools where medicine was taught, anatomy should form part of the curriculum and should be illustrated by dissections." Roth (p. 13) says that as early as 1391 "King John I gave the Aragonian University of Lérida, the privilege to dissect the body of a convict, every three years" and that in 1488 "Ferdinand permitted the Catholic Order of Saint Cosmas and Damien, Saragossa to dissect in the hospital." García (p. 111) even claimed that Chinchilla showed that other Spanish anatomists before Valverde wrote works which have greater value than his work and that their anatomic descriptions as well as their treatment of physiology were better.

It seems strange that a work which enjoyed so many editions abroad in Italian, Latin and Dutch should have appeared in but a single edition in Spanish and it is well to remember that Vesalius himself was brought to Spain and that his sojourn there probably was not without influence even if he was not permitted to have a skull in Madrid. However, it is not our purpose to belittle Val-

a.



b.

c.

FIG. 7

Two torsos (a and b) after Vesalius (pp. 559-560) and the equivalent combined Valverdean figures (c) (Fig. I and II, Pl. unnumbered, Bk. III, p. 108). Note also the added youthful genitalia, younger head and neck and the added abdominal adipose torus.

verde or his influence. The mere fact that his anatomy appeared in so many editions in foreign languages shows that it enjoyed unusual popularity and may have had unusual influence, in some portions of Europe. Allowing for the fact that the leaves only are numbered in Valverde's work, it is somewhat over half as large and depends on the Fabrica very largely in regard to legends and text. Our present purpose merely was to inquire into the source of the Valverdean illustrations.

Neuberger and Pagel (1903) said that Valverde made some corrections notably in regard to the muscles of the eye, in the vertebral arteries, and in the branching of the subclavian vein, but that he attributed a series of discoveries to himself which others had made before him, especially mentioning the "stirrup." García (p. 10) credited Valverde with discovering ". . . the inter-muscular synovial sheaths" unknown to modern anatomy, and Fernández (1906) declared (p. 588, Vol. 2) that Valverde "wrote a notable work on anatomy, in which one has searched for and found things announced [lit. sold] as new by some modern anatomists." García also spoke of ". . . eight magnificent plates on the digestive and reproductive organs among which are some especially interesting ones of the female genital apparatus." Aside from the fact that the 1556, 1560 and 1586 editions contain only six such plates, including the bizarre figure of the uterus, five of these plates and four of the six figures on the other plate undoubtedly are Vesalian. Moreover, Valverde's belief that muscles are bathed by something like the synovia of joints and that such a muscle as (N), his fifth of the eye, exists, are serious errors instead of discoveries as is his confirmation or acceptance of the idea of Colombo, that the heart is not composed of muscle. And, to claim that Valverde was a better anatomist than Vesalius is to commit a very grievous error.

It would, indeed, be a poor student who with the help of his teacher Colombo, hostile to Vesalius, and preceptor Eustachi, could not find some errors in the work of the Master. It may be to the credit of Valverde that he did not reproduce the bicornuate uteri or the carnivorous placentae from the first edition of the Fabrica. However, in view of the fact that he copied that surprising figure of the uterus and other Vesalian errors, without comment, shows

that he could not have been very familiar with what it was meant to picture. However, if his work was so influential in the introduction of Vesalian anatomy into Spain, he would seem to deserve a larger place in historical reference works than he has enjoyed. His book may have been decidedly popular because it was so much smaller and convenient in size and less costly, but also may have appealed to some students because of the grotesque changes introduced into some of the illustrations. Moreover, students who like some later writers on Valverde, do not know that a normal omentum cannot, without stretching, be placed between the teeth of the extended head of a cadaver, might be amused by the Valverdean illlustration.

Since a detailed comparison of the text of the Composición with that of the Fabrica would require a detailed and extended discussion, we have not undertaken it. In this four hundredth year of the publication of the Fabrica, we are happy to testify, however, that approximately ninety-five per cent of the Valverdean illlustrations were taken from the Fabrica of 1543 and 1555, and that a number of them were masked so by non-anatomical and anatomical alterations, as to mislead such authorities as Choulant and Roth three hundred, and physicians, four hundred, years later. The question why such things were done still remains. Valverde himself did not mention these changes and as far as we could ascertain neither did any of his apologists, save Morejón, do so, or try to explain or justify them and Morejón's denial regarding sword and buckler, while true, was misleading, for mail was added on two torsos. Some of his defenders have regarded illustrations as original with Valverde which, upon closer scrutiny, easily reveal their Vesalian origin. If the text is as Vesalian as the illustrations and legends, the worst indictment against Valverde is overwhelmingly supported, for no one can hold that he properly acknowledged their source or called attention to the needless and pointless masking of the Vesalian illustrations by giving him equal credit with the Archbishop and his teacher and by referring readers to the Fabrica for fuller information.

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VESALIUS—VALVERDE—PATOUSAS:

The Unpublished Manuscript of the First Modern Anatomy in the Greek Language

PAN S. CODELLAS

The Vesalius and Copernicus Year of 1943 imposes upon us the duty to render a fitting commemoration of two great humanists and scientists of the sixteenth century, who cast a guiding beam of bright light into the World of Modern Man; the first on the structure of Man and the second on the System of the World. Here it appears appropriate to insert George Sarton's comment:[1] "In the year 1543 there were published two books of fundamental importance: first, the *De revolutionibus orbium coelestium* of Nicolaus Copernicus, one of the first copies of which was brought to his deathbed on May 24; second the *De humani corporis fabrica* of Andreas Vesalius published in June. Thus these two books which were, respectively, the foundation of modern astronomy and the foundation of modern anatomy, appeared within a couple of months. The German invasions make it impossible to celebrate the fourth centenaries of these two events in the proper manner, the first in Belgium, the second in Poland. However, Belgians and Poles will celebrate them, wherever they happen to be, and the citizens of the free world will celebrate with them." It may be remarked with the same somber tone, that L. Patousas directed the flood-light of Vesalian Anatomy eastward during the dark and dead days, but now when a bit of recognition and appreciation could be asserted, there is no way of showing it. The almost unknown son of Greece must wait for happier days.

The National Library of Greece at Athens owns a precious item, MS. No. 1487. In the Catalogos of the MSS. of this library by John Sakkelion and Alcibiades Sakkelion the following description is given referring to this manuscript:[2] "Fasciculus of ordinary

[1] George Sarton, The Years "Forty Three," *Isis*, Cambridge, Mass., XXXIX, part 3: 193, 1943.

[2] Ioannes Sakkelion and Alcibiades Sakkelion, Catalogos of the Manuscripts of the National Library of Greece (in Greek), Athens, 1892, p. 266. (No. 1487).

paper of 0.29 in length and 0.19 (cm.) in width, written during the eighteenth century consisting of 396 folios it is inscribed thus: *Anatomia of the Human Body of Joannes Valverde* with text of the same recently printed and enlarged with some additional tables, now set forth in the Vernacular Dialect by L. Patousas, with the expense of the some time most holy and among the priest-monks Superior Damascenus Petrakes, in the year 1738. Venice in the Printing of the Giunti year 1608." A considerable part of what is given here with regard to this MS. is based on the article of Aristoteles Kousis.[3] On page 593 of the manuscript we read that it was the property of the library of the monastery of Theotokos the Ecclesiotissa. Kousis, listing all the anatomies published in the Greek language since the Fall of Constantinople (1453) to recent times and discussing this manuscript states, "this translation into the Greek language of the Anatomy of Valverde in addition, perhaps, is the first Descriptive Anatomy in the Greek language." This expert opinion of Kousis is accepted here. The edition of Valverde's anatomy which the translator used is that in the Italian language printed in Venice in the year 1606. The Italian edition of 1608 is a reprint of 1606. Concerning the translator we know nothing. Professor Kousis, as he himself states, undertook personally to identify the man, his family tree or to throw some light upon this absolutely dark topic; he utterly failed. The name Patousas has been known in Athens since the seventeenth century. Among the persons named Patousas there was one physician about the time our translator lived, but his first name was Nicolas; he was a surgeon, studied in Rome and later he went to Germany where he died. There is no one with a first name initial L. The other, Georgios Patousas, became scholarches of the Phlanginean Hellenomouseion (School) at Venice (1723-61). A third, Joannes Patousas, studied theology at the University of Padua and later was appointed scholarches of the same institution (1703-14). They both were exponents and teachers of the Greek vernacular, which appears to have been used widely and taught in the Greek schools, instead of the classic, to enable the Greeks to read and write the language of their own everyday life.

[3] Aristoteles Kousis, I. Iatrikoi Kodikes. The First Greek Anatomy. Anecdotos Hellinike Metaphrasis of the Anatomy of Valverde of the beginning of the XVIIIth century (Greek). *Archives of Medicine*, Athens, 1, No. 1: 29 ff., 1905 (Febr.).

The translator of Valverde utilized the vernacular to facilitate the study of medicine among the young Greeks whose available educational opportunities were scanty. There is no note informing us by whose hand it was written. Due to the present conditions no detailed study of this interesting anatomical manuscript can be attempted. Its study would be of particular interest by throwing light on the first anatomical education in Greece. The anatomical nomenclature adopted into the vernacular is of special importance. The first ten pages of Patousas' Greek Anatomy are devoted as in the original to the dedications, then the preface proper begins (p. 7). The First Book follows with the Heading: "*First Book of the 'Anatomical Historia,' composed by Joannes Valverde the physician, in which the discussion is about the Bones, that is the 'Kokala,'*" where he talks about the bones of the entire body seriatim (pp. 11-102). The second deals with the nails, cartilages of the ears, nose and larynx (102-7). The third book is on the joints and muscles (151-258). "The parts necessary for Digestion and Generation and of the Membrane that encloses all these parts, which we call Peritonaeum" occupy pages 337-84. Respiratory system and the heart follow (406-46). "The necessaries for Locomotion and Sensation" (458-77); on the veins and arteries (507-71); finally on the nerves and sense organs (619-57). After each chapter there is an explanation of the Figures of the original text, which shows that the translator had in mind to insert and incorporate into his work copies of Valverde's Tables. At the end there is a "*rich and excellent table of all the contents of the book arranged in alphabetical order*" occupying one hundred pages. The Vulgate Dialect of the entire work cannot be judged without comparison with other works of the same period, with official papers and personal correspondence. The latter will demonstrate the idiom of the people without any literary refinement and in a plain and unadorned fashion.

The second half of the fifteenth and the beginning of the sixteenth century present the Iberian Peninsula studded with an increased number of universities. The University of Seville was founded by Ferdinand and Isabella in 1521 with the special right to teach medicine. Charles V in 1531 founded the University of Granada. A decree published in 1550 directed that all the schools where medicine

was taught, should include anatomy in the curriculum and should illustrate it with dissection. Juan Valverde Di Hamusco is born about this period (c. 1520) at Villa de Amusco of the province of Burgos.[4] He died at an advanced age in Rome. He studied the humanities and philosophy at the University of Valladolid. This estudio general had a chair in physics (i. e. medicine).[5] In 1551 at Valladolid the first anatomical work to appear in the Castilian tongue was published by Montaña. During this time anatomy was unpopular.[6] After these studies Valverde went to the University of Padua where he took up medicine. At Padua he attended the lectures and demonstrations in anatomy given by the celebrated *Realdo de Columbo*. When he completed the course of medicine at Padua he went to Rome as the physician of the Cardinal Juan de Toledo, archbishop of Santiago. While here Valverde continued his interest in anatomy, attached himself to Eustachius and followed his dissections. It is not certain if Valverde dissected nor to what extent he gained anatomical knowledge of the human body. In Rome, however, Valverde published the first edition in Spanish of his *Historia de la Composición del Cuerpo humano* (1556). The edition consists of text and forty-two plates and has a title page engraving (fig. 1). The edition of Rome, 1560 is an Italian translation made by Anton Tabo and revised by the author. Another edition of Anton Tabo's Italian translation was published, " Venetia 1586, fol. nella stamperia de Giunti." It contains four new myologic plates. There was a reprint of this edition " i Vinetia, nella Stamperia de Giunti, 1606." This is the edition upon which the Greek translation was based (fig. 2). The classification of the text follows Vesalius' book, which is Galenic in its arrangement. The entire work is divided into seven books or chapters: Osteology, the muscles, the organs necessary for digestion and generation, the organs of life, the members necessary for locomotion and sensation, wherein the eye is included; the sixth book treats the veins and arteries, it is accom-

[4] Eduardo Garcia del Real, Historia de la Medicina en España, Madrid, 1921, p. 100 ff.

[5] Hastings Rashdall, The Universities of Europe in the Middle Ages (ed. F. M. Powicke and A. B. Emden), Oxford, 1936, II, p. 71.

[6] James M. Ball, Valverde a Spanish Anatomist, *The St. Louis Med. and Surg. Journ.*, St. Louis, LXXII: 77 ff., 1897.

Fig. 1. Frontispiece engraving of Valverde's Anatomia in Spanish, Roma, 1556.

(Courtesy of the Army Medical Library, Washington, D. C.).

Fig. 2. Frontispiece of Valverde's Anatomia, Vinetia, 1606. The original of the Greek translation.

(Courtesy of the Army Medical Library, Washington, D. C.).

panied by "bellas laminas de todo el sistema arterial y venoso."[4] The seventh deals with the nerves. The artist of the illustrations is the Spanish painter *Gaspar Becerra*, born in Baeza in 1520. The Lorrainer Nicolas Beatrizet or Beautrizet, Niccolo Beatrici (born at Thionville), is supposed to be the engraver. Several plates and the bust of the author bear the monogram N. B. The anatomists and historians of medicine that analyzed and compared Valverde's Anatomia and Vesalius' Fabrica divide themselves into two camps, the accusing, which brand Valverde as an outright plagiarist,[7] while the defending and opposite group praise with extolling adjectives and place Valverde above Vesalius. The interrelation and share of originality of the Anatomia of Valverde and the Fabrica of Vesalius entitles the Greek manuscript to lay claim on direct lineage to the Fabrica.[8] The sixth edition of the Fabrica (1604) has a title-page showing a dissection scene with Vesalius as the demonstrator (fig. 3); to the left of the maestro prominent in front looking on is a person labelled by the artist Valverde. This is a sign that Valverde had a reputation as an anatomist. The wide circulation of the books corroborates this. Although Valverde himself states that he simply copied the Vesalian figures, several of them nevertheless do not occur in Vesalius' work, e. g. "Marsyas" muscle-man holding his own skin in the right hand and a dagger in the left; several representations of the abdominal muscles, of the omentum and the intestines; a standing pregnant woman with abdomen cut open showing the gravid uterus, placenta, membranes, foetal circulation, and the foetus in utero (Lib. III, fig. 6); representations of the principal veins and arteries and many others. Parts of the body are covered with armour. It appears Valverde's anatomy was selected to be translated as being simpler, handier, smaller and cheaper.

Valverde rendered a great service to his native land by introducing the newest and most advanced anatomical knowledge. The rest of Europe also profited from his book as is shown from the translations into other languages and the number of editions. This rather pro-

[7] Ludwig Choulant, History and Bibliography of Anatomical Illustrations, Translated and edited by Mortimer Frank, Chicago, 1920, p. 36.

[8] Andreae Vesalii, De humani corporis fabrica libri septem, Basileae ex off. J. Oporini, 1543.

——— Sixth edition (1604).

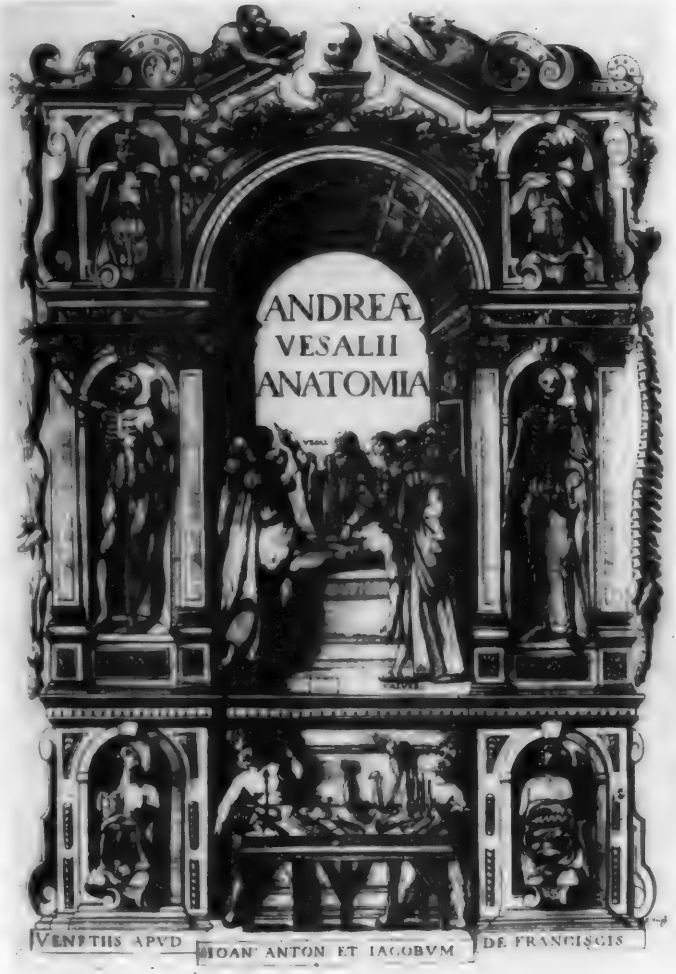

Fig. 3. Title Page of Vesalius' Anatomy, Sixth Edition (1604).

Kindly furnished by Dr. John Fulton, Cushing Library, Yale University, New Haven.

longed explanation has been offered in order to give an idea of the complexion of the Greek manuscript.

Andreas Vesalius was born on the 31st day of December 1514 at Brussels. *De corporis humani fabrica libri septem*[9] appeared in 1543. In the year 1563 he undertook a pilgrimage to Jerusalem; while returning was wrecked on the Island of Zakynthos (Greece) where he died on the 15th of October 1564, probably of typhus. Vesalius is the most precious product of the Renaissance. He attained full maturity when he reached Italy. The Classical Scholarship, the Revival of Learning, the Renaissance of Art are the foundations of Vesalius' successful undertaking. Vesalius' work on Galen and the familiarity with the ancients, his longing and itching to set his own hands and dig with his instruments into the human corpses, as he was accustomed to do with animals brought forth the Fabrica. Printing to diffuse knowledge, illustrations to aid visually, a better method of teaching and demonstrating, all combined with his ability and natural gifts to make Vesalius the Father and the First Teacher of Modern Anatomy.

In the West Letters, Science, Art, interest in man himself is awakened and the direction of thought and effort of the Renaissance Man proceeds to promote the Modern Man. In the East the Ottoman Turk, Mongolian in race and Mohammedan in religion, appears. Orkhan (1326-59) won the first foothold on European soil by the occupation of Gallipoli (1326). The Turkish advance and occupation of the Byzantine Empire continues until Mohammed II, the Conqueror, captured in 1453 the Capital of the Eastern Roman Empire, Constantinople. The news startled Europe for a moment, but no serious thought, nor action was undertaken. Mohammed would not be happy nor satisfied with vassal States paying tribute, but with action to subjugate the Balkan Peninsula. With the destruction of the Trebizond and the complete occupation of Peloponnesus in 1461 there is not an inch of free Greek soil left. The Turk wanted a dominion without foreigners having privileges. This brought a series of Turco-Venetian Wars which finally ended in the squeezing of Venice into the Adriatic water corridor (fig. 4), according to the terms of the Treaty of Passarowitz in 1718. Mohammed

[9] Charles Singer, The Evolution of Anatomy, New York, 1925, p. 111 ff.

had shown more astute statesmanship in his dealings with the Greek Church by allowing the "Privileges." [10, 11]

The Fall of Constantinople resulted in a veritable exodus of the population to Christian Europe. Waves of refugees seeking a haven fled to England, France, Spain, the Northern Balkan peninsula and elsewhere.[12] The most significant wave was that which sought Northern Italy. Venice should be singled out, for there the Greeks felt a sense of security, safety and comfort under the winged lion of the Republic of St. Mark. The intellectual, artistic, commercial and hospitable atmosphere made life enjoyable. Before the discovery of printing the Greek language was fashionable and familiar. Venice became the principal center of the wandering Greeks. There was established in 1573 the Greek Gymnasium and Hospital under the superintendence of the Cretan Franciscus Portus, graduate of Padua.[13] Among the teachers of this Gymnasium is Theophilos Koridaleus of Athens (1609), iatrophilosopher. In 1621 the Corfiote Thomas Phlangines founded the Seminary named after him Phlanginean, and recognized by an act of the Venetian Government and of the University of Padua (1664). The graduates of this school were eligible to be admitted to the University of Padua. The school had a library possessing several valuable Byzantine manuscripts. In a book of the Phlanginean published under the editorship of John Patousas, Superintendent (1708) there are some parts written in the Greek vernacular.[14] This encourages the hypothesis that L. Patousas belonged to this group and most probably was a relative of these educators. The printing shop of Aldus became the headquarters of the Greeks in Diaspora.[15]

The Ionian Islands and Crete under the Venetian rule enjoyed a close attachment to the capital and became of great help to the educa-

[10] Critoboulos of Imbros, Life of Mohammed II. ed. C. Müller, *Fragm. historicorum Graec.*, Paris, 1841–83, V, p. 40.

[11] Georgios Phrantzes, Chronicon (1258–1476), ed. I. Bekker, *Corp. scr. hist. byzantinae*, 1838. (Eyewitness).

[12] Greeks in Diaspora, Hellenike Megale Encyclopaedia (Greek), Vol. X.

[13] John Beloudes, The Colony of the Orthodox Greeks in Venice (Greek), Venice 1893, p. 116.

[14] John Patousas, "Flowers of Devotion . . . to the Mother of God Maria . . ." Venice 1708.

[15] Ambroise Firmin-Didot, Alduce Manuce et l' Hellénisme à Venise, Paris, 1875.

THE
OTTOMAN ADVANCE
IN
EUROPE & ASIA MINOR
Scale of Miles
River Danube
R. Danube
R. Bug
R. Dniester
R. Pruth
TRANSYLVANIA
MOLDAVIA
WALLACHIA
SERVIA
BULGARIA
BLACK SEA
KARAMAN
KURDISTAN
R. Tigris
R. Euphrates
Rhodes
Lake Tecce
Iconieh
Angora
Nisibis
Mardin
Tana
Jassy
Tschetin
Widdin
Paschanest
Belgrad
Podrina
Nissa
Sophia
Adrianople
Curzola
Ragusa
Scutari
Durazzo
Janina
Salonichi
Thessalonica
Smyrna
Rhodes

tion of the Greeks up to the time of Napoleonic subjection (1797). In the Courts of Justice the Greek language was authorized.

The *Universitas Patavina* was founded in the year 1222, as its seal to this day designates.[16] The Greek "Nation" (fig. 5, a, b, c), numbered more than two hundred. The non-Italian students were divided and organized into "Nazioni" under the recognition of the University authorities. Among them we meet the *Ultra marine glorious nation*, whose entire membership consisted of Greeks, of which about half were Cretans.[17] The private and intellectual life of the Greeks during the first two centuries under the Turkish rule was of the lowest level. In the eighteenth century the number of schools increased greatly. This strengthens the opinion expressed in this paper regarding the importance of the Greek language and education spreading among the peoples of the Balkans. The education of the Turks themselves up to nineteenth century was almost nil. After the Fall of Constantinople the doctors fled to Western Europe, especially to Italy. Within a short time Greece was left without physicians at the mercy and rapacity of empirics, Turks, Italians, Albanians, French and Greeks.

From the fifteenth century on we meet a number of physicians who graduated from the universities of Europe, returned home and practiced medicine. Theses and medical books were written by some of them. When the eighteenth century came the number of physicians increased greatly. Probably this general situation inspired or prompted the translation of the Anatomy of Valverde motivated by patriotic and altruistic reasons.

In Serbia under Turkish rule there was an intellectual stagnation with the only bright spot being the translation of Greek books.

Bulgaria falling under the Turkish rule (1398) shows no sign of literature for two centuries.[18] The language was written with Greek characters (Damascene Period). The Greeks, better educated and higher socially, made the Bulgarians follow their ways and learn the

[16] Acta Universitatis Patavinae septima saecularia celebrantis MCCXIII–MCMXXII, Padova 1925, p. 2.

[17] G. E. Typaldos, The Greek Students of the University of Patavium, *Annual of the Byzantine Studies*, Athens, 1929, p. 369 ff. (Greek).

[18] K. M. Apostolides, Boulgaria (Greek Diaspora), Megale Hellenike Encyclopaedia, Athens 1934, X, p. 732.

Fig. 5a. "Insignia Inclitae Nationis Ultramarinae." The man represents the future emperor; the globe, the universe which will be his domain.

Fig. 5b. The coat of arms of Thomas Ralli Constantinopolitanus segr. artist.: Schools of Medicine, Theology etc. Blue background, green cypress, white doves.

Fig. 5c. "Bozza Bartolomaeus Cretensis Eques Juristarum Rect." Names with the first syllable Bo-(ve) take the bull as emblem.

Greek language. The Greek element was the representative of European advanced knowledge and culture. The official languages were Greek and Turkish. The Bulgarians show their first sign of nationalism at the end of the eighteenth century. Archbishops, bishops, priests and monks were Greeks or educated in Greek.

The Principalities of Moldavia and Wallachia since the time of Bogdan in 1513 enjoyed a comparative freedom, having a semi-independent status under the Turks. Roumania can boast of early schools and libraries and higher education since 1561. During the first years of Turkish rule the official correspondance was carried on in the Greek language, later no State official was appointed, if he did not know Greek; education was encouraged; many of the Phanariotes princes founded institutions endowed by their own money. The Phanariotes' Period (1710-1821) made Roumania the most enlightened country in the Balkans. There was a revival of Greek thought. From the extent and the proportion of printed books the importance of the Greek language can be judged: from 1673 to 1716 there were 117 books printed of which 46 were Roumanian, 41 Greek, 2 Greek-Roumanian, the remainder being in the Slovene language.[19]

The Armenian, Albanian and Jewish element in Turkey, although they attained high offices, did not leave any noteworthy trace in medicine.

In conclusion it may be said that the Greek language was widespread and used in the Balkan Peninsula during the Turkish rule. The progressive and scientific medicine of the time was practised and represented by the Greek physicians continuously during this period. These important factors must have forced L. Patousas and his financial supporter to undertake the translation of Valverde's Anatomy. Vesalian Anatomy through the Anatomia of Valverde of which the Greek manuscript is a translation was thus diffused into Eastern Europe. The Greek manuscript claims Vesalian lineage and is the first modern Anatomy in the Greek language.

In closing I wish to thank Mrs. Francis Tomlinson Gardner, Librarian of the University of California Medical School, for lending me the copy of Valverde's Anatomia and other courtesies, the

[19] Aim. Karavia, Roumania (Grammata), s. v., ib.

staff of the Lane Medical Library of Stanford University, members of the Army Medical Library, The Syndics of the University Press, Cambridge and the Macmillan Company publishers for the kindness they extended in my effort to complete this paper during these crowded times. Last but not least Dr. Sigerist for his wise guidance in moulding the theme.

AN EXHIBIT ON THE LIFE AND WORKS OF VESALIUS

GENEVIEVE MILLER

The exhibit was prepared by staff members of the Institute of the History of Medicine in commemoration of the 400th anniversary of the publication of Vesalius' *De humani corporis fabrica libri septem* of 1543.

Large fiber-board panels mounted on the walls and upright panels placed to divide the hall into cubicles were used for mounting pictures and the explanatory texts. Each cubicle contained glass cases for the demonstration of books. The panels were painted with grey casein paint, and each section was labelled with blue cardboard letters, the sections being subdivided by blue ribbons.

The exhibit begins with a long panel on Vesalius' early life and education (See Figs. 1 and 2). The section ORIGIN AND BIRTH tells about his ancestors who were distinguished scientists and physicians. There is a photographic reproduction of his coat of arms which contains the three weasels, reminiscent of the former residence of the family in Wesel. The title-page of Cardanus' *Libri quinque*, Nuremberg, 1547 which contains Vesalius' horoscope on page 178 is also shown, as well as a photograph of the portrait of Vesalius with a handwritten copy of the horoscope beneath, as preserved in a copy of the *Fabrica* owned by Dr. Harry Friedenwald of Baltimore. The next section, LOUVAIN, CA. 1522-1533, describes Vesalius' youth and early education. Children are shown swimming with inflated ox-bladders as Vesalius did as a child and which he dissected. Other pictures include one of the University of Louvain in Vesalius' day, a title-page of one of his textbooks, Albertus Magnus *De secretis mulierum*, and a reproduction of the ventricles of the brain from the *Margarita philosophica*, Strassburg, 1504 which Vesalius also studied.

The section PARIS, 1533-1536 continues Vesalius' education. An

FIG 1.

First panel of Vesalius exhibit.

early picture of Paris, of the anatomical theater of the university, portraits of Jacobus Sylvius and Winter of Andernach, the chief teachers of Vesalius, the title-page of Galen's *De usu partium*, Paris 1528 which was used as a textbook, and a portrait of his fellow student Michael Servetus comprise the section. His education concludes with LOUVAIN, 1536-1537 showing a contemporary picture of the city, and a photograph of his first publication, a paraphrase or free translation of the ninth book of the *Almansor* of Rhazes, 1537. Two editions appeared during that year, one in Louvain and the other in Basle.

Next we see a panel on ANATOMY BEFORE VESALIUS showing the crude representations of the "Five Picture Series," the Mustio pictures of the child in utero which were popular in the Middle Ages, and illustrations from Guido de Vigevano (1435) which depict the actual process of dissection. The illustrations, however, are very crude and unrealistic. Several other photographs portray dissecting scenes, one of which clearly shows how the professor sat in his chair and let the surgeon and demonstrator do the work as he read passages from Galen (*Fasciculus medicinae* of Ketham, 1493). Illustrations to pre-Vesalian anatomists such as Mondinus (1316), Richard Helain (1493) show an improvement in the illustrative technique.

THE AWAKENING OF THE RENAISSANCE is illustrated by two sets of contrast pictures. The first consists of the illustration to the gynecological section of Ketham's *Fasciculus medicinae* in two editions, 1491 and 1493. The 1491 edition has a diagrammatic picture following traditional lines, while in 1493 this was replaced by a realistic picture in the style of the Renaissance. The same trend is seen in two manuscript pictures illustrating the seat of the sensory organs and of the mental faculties in Aristotle's *De anima*, made about the same time.

This leads us logically to THE ARTISTS, a section which consists chiefly of drawings by Leonardo da Vinci contrasted with earlier pictures on the same subject. His accurate observation and masterly manner of recording his observations are clearly evident in such drawings as those of the skeleton which depict the curvature of the spine more accurately than even Vesalius did, and his picture of the

FIG. 2.

General view of first half of Vesalius exhibit.

bear's foot. The drawing traditionally ascribed to Michelangelo of "Two Doctors Dissecting a Corpse" is also displayed. This drawing is now attributed to Bartolomeo Manfredi (c. 1580-1620).

After his preliminary training Vesalius went to VENICE AND PADUA, 1537 where he saw patients with local physicians and experimented with the China-root, a new remedy. Here he met Stephen Van Calcar who was also from the Netherlands and a student of Titian. A contemporary picture of Venice, together with portraits of Calcar and Titian serve as illustrations for this period. Later in the same year, he took his degree as Doctor of Medicine at the University of Padua (illustrated by modern photographs) and was appointed professor of surgery.

In April 1538 the TABULAE SEX were published. The first three pictures were drawn by Vesalius, and the three skeleton pictures by Calcar who also financed the publication. All six plates are shown.

His ACTIVITIES 1538-1542 include the preparation of a new edition of Winter of Andernach's anatomical textbook *Institutionum anatomicarum secundum Galeni sententiam ad candidatos medicinae libri quatuor* (Venice, 1538) and the publication in 1539 of an epistle on phlebotomy. At the same time he edited the anatomical sections in a new edition of Galen issued by the Venetian publisher Giunta. The illustrations in this section include photos of the title-pages of the books Vesalius worked on and a page from the *Fabrica* showing the dissecting instruments he used in this period when he was preparing his greatest book.

The central section of the exhibit embraces Vesalius' great contributions to the history of medicine, the FABRICA, 1543 and the EPITOME, 1543. After completing his book in Italy, the manuscript and wood blocks for the illustrations were transported across the Alps to Basle, Switzerland where they were printed by Johannes Oporinus, the printer and humanist. A map of Basle in the 16th century, a portrait of Oporinus, and his printer's mark introduce the section. Then the famous woodcuts are demonstrated, including the pictorial initials, and the three skeleton figures with their dramatic poses. A striking feature are the 14 muscle-men which are mounted side by side to show the continuous landscape executed by the artist. Calcar was a faithful disciple of the Renaissance, and his woodcuts

General view of first half of Vesalius exhibit.

FIG. 3.

Central section of exhibit, showing the continuous landscape behind the muscle men

of anatomical figures placed in graceful positions against a scenic background illustrate the spirit of his time. The *Epitome*, a shortened version of the *Fabrica*, was published at the same time. Shown in the exhibit are title-pages of the Latin and German editions and reproductions of the nude figures of a man and woman which are not in the *Fabrica*.

The following section THE PROBLEM OF VARIABILITY treats a technical aspect of Vesalius' work from the standpoint of modern anatomy. In his dissections he naturally observed variations in structure, and therefore he had to decide what was normal. Dr. Owsei Temkin and Dr. William L. Straus, Jr. have selected a number of instances of variability in Vesalius' work and have discussed them in a paper in this same number (cf. pp. 609-633). All the illustrations in this section of the exhibit are reproduced there.

LATER YEARS carries Vesalius on through the remainder of his life. In 1544 he joined the court of Charles V and went to Madrid. A portrait of Charles V and the title-page of Vesalius' book on the China-root (1546) are shown. Finally, after serving 20 years in the court he met his death on the island of Zante off the coast of Greece while returning from a pilgrimage to the Holy Land. The anatomical tradition at Padua was carried on by Vesalius' successors, Colombo, Falloppio, and Fabricius ab Aquapendente, illustrated by portraits of these men and a drawing of the Paduan anatomical theater.

ANATOMY AFTER VESALIUS is briefly portrayed by illustrations from Valverde who copied or modified the Vesalian illustrations (*Historia de la Composición del Cuerpo Humano*, 1556), Eustachius' *Tabulae anatomicae*, completed in 1552 but not published until 1714, and Albinus' *Tabulae skeleti et musculorum corporis humani*, 1747.

The new anatomy stimulated EMBRYOLOGY which is depicted in the next section. Aldrovandus and Coiter began to study the development of the egg, and Rueff's *De conceptu et generatione hominis*, of which the title-page is shown, tried to apply Aldrovandus' ideas to obstetrics. The most outstanding embryologist, however, was Fabricius ab Aquapendente, successor of Vesalius and

FIG. 4.

General view of last half of exhibit.

teacher of William Harvey. His classic publications were *De formatione ovi et pulli pennatorum* (illustration reproduced) and *De formato foetu*. He in turn stimulated Harvey to embryological work, and the title-page of Harvey's *De generatione animalium* (1651) shows Zeus liberating living beings from an egg (ex ovo omnia). Marcello Malpighi began microscopic embryology and a table from his *De ovo incubato* is shown. Regnier de Graaf's (portrait and table from his book *De mulierum organis generatione inservientibus*) fundamental discovery of the follicles of the ovary was a necessary step in the development of embryology.

Anatomical knowledge was extended by the use of the microscope, and hence MICROSCOPY is the next section of the exhibit. Swammerdam, Leeuwenhoek, and Malpighi, all made fundamental discoveries, some of which are illustrated here (Leeuwenhoek's drawing of spermatozoa and heart muscle). A photograph of a number of 17th and 18th century microscopes is also included.

The last section of the exhibit THE ANATOMICAL APPROACH TO MEDICINE (See Fig. 5) traces the development of modern medicine which has been due largely to the anatomical approach introduced by Vesalius. Beginning with the *Fabrica* in 1543 which treated of the structure of the motionless, dead body, anatomy then became *anatomia animata*, living anatomy or physiology, with the discovery of the circulation of the blood by William Harvey (1628). Morgagni carried the development a step further by his anatomical investigation of the diseased organs of the body which led him to conclude that the seat of disease is in the organs (1761). Bichat (1799) pushed back the seat of disease to the tissues, and ultimately it came to the cell through the investigations of Virchow (1858). The anatomical approach led also the discovery of new physical methods of detecting disease, such as by percussion (Auenbrugger, 1761) and the use of the stethoscope (Laennec, 1819). The 19th century witnessed the appearance of a host of new instruments to detect pathological conditions in the body: the ophthalmoscope (1851), laryngoscope (1855), gastroscope (1869), cystoscope (1878), rectoscope (1895), x-ray (1895), and bronchoscope (1899)

FIG. 5.

The concluding panel of Vesalius exhibit.

A Check-List of Vesaliana in the Welch Medical Library

In preparing this check-list the same arrangement was followed as that used in the recently published *Bio-Bibliography of Andreas Vesalius* by Harvey Cushing (New York, Schuman's, 1943). After each item the Cushing number has been added.

1. *The Paraphrase of the Ninth Book of Rhazes*

Abubetri Rhazae Maomethi . . . opera exquisitiora, . . . Per Gerardum Toletanum medicum Cremonensem, Andream Vesalium Bruxellensem, Albanum Torinum Vitoduranum, latinitate donata, . . . Basle, H. Petri, 1544. [I.-3]

2. *The "Tabulae sex"*

Moriz Holl and Karl Sudhoff, ed. Des Andreas Vesalius sechs anatomische Tafeln vom Jahre 1538. Leipzig, J. A. Barth, 1920. [II.-3[A]]

De dissectione partium corporis humani libri tres, a Carolo Stephano . . . editi. Una cum figuris, . . . a Stephano Riverio Chirurgo compositis. Paris, S. de Colines, 1545. [II.-23]

Ioannis Tagaultii . . . de chirurgica institutione libri quinque. Venice, V. Vaugris, 1544. [II.-28]

3. *Guenther's "Institutiones anatomicae"*

Institutionum anatomicarum secundum Galeni sententiam ad candidatos medicinae libri quatuor. Padua, J. Fabrianus, 1550. [III.-3]

4. *The Venesection Epistle*

Epistola docens venam axillarem dextri cubiti in dolore laterali secandam (1539). Preface by M. A. van Andel. In: Opuscula selecta Neerlandicorum de arte medica, Amsterdam, 1930, Vol. 8, pp. xii-xxxi, 1-75. [IV.-3]

5. *Contributions to the "Opera Galeni"*

Galeni omnia opera. Venice, Giunta, 1550. [V.-1]
" " 1556.
" " 1609.
" " 1625.
Basle, Froben, 1562.
Lyon, Frellon, 1549-50.

The concluding panel of Vesalius exhibit.

6. *The "Fabrica" and its sequelae*

De humani corporis fabrica libri septem. Basle, J. Oporinus, 1543. [VI.A.-1] 2 copies.

De humani corporis fabrica libri septem. Venice, F. Franciscius and J. Criegher, 1568. [VI.A-4]

Anatomia. Venice, J. A. and J. de Franciscis, 1604. [VI.A.-5]

H. P. Leveling. Anatomische Erklärung der Original-Figuren von Andreas Vesal. Ingolstadt, A. Attenkhouer, 1781. [VI.A.-14]

H. P. Leveling. Anatomische Erklärung der Original-Figuren von Andreas Vesal. Ingoltsadt, A. Attenkhouer, 1783. [VI.A.-15]

Icones anatomicae. Ediderunt Academia Medicinae Nova-Eboracensis et Bibliotheca Universitatis Monacensis. New York and Munich, 1934(-35). [VI.A.-16]

Von des menschen cörpers Anatomey . . . unnd durch D. Albanum Torinum verdolmetscht. Basle, J. Herpst, 1543. [VI.B.-2]

Compendiosa totius anatomie delineatio, aere exarata: per Thomam Geminum. London, J. Herford, 1545. [VI.C.-2]

Anatomes totius, aere insculpta delineatio . . . per Iacobum Grevinum. Paris, A. Wechel, 1564. [VI.C-5]

Opera omnia anatomica & chirurgica cura H. Boerhaave . . . & B. S. Albini. Leyden, J. du Vivie and J. and H. Verbeek, 1725, 2 volumes. [VI.D.-8] 4 copies.

Librorum Andreae Vesalii Bruxellensis de humani corporis fabrica epitome: cum annotationibus Nicolai Fontani. Amsterdam, J. Jansson, 1642. [VI.D.-13]

Epitome anatomica . . . Notae ac commentaria P. Paaw. Leyden, J. a Colster, 1616. [VI.D.-19]

Epitome anatomica . . . Notae ac commentaria P. Paaw. Amsterdam, H. Laurentius, 1633. [VI.D.-20]

Historia de la composición del cuerpo humano, escrita por Ioan de Valverde de Hamusco. Rome, A. Salamanca and A. Lafrerii, 1556. [VI.D.-32]

La anatomia del corpo umano composta da Giovanni Valverde. Venice, Giunta, 1586. [VI.D.-37]

Anotomia del corpo humano di Giovanni Valverde. Venice, Giunta, 1608. [VI.D.-40]

Anotomia del corpo humano di Giovanni Valverde. Venice, N. Pezzana, 1682. [VI.D.-42]

Anatomie, oft levende beelden vande deelen des menschelicken lichaems. Antwerp, C. Plantin, 1568. [VI.D.-44]

A. Vesalii en Valverda anatomie ofte afbeeldinghe van de deelen des menschelicken lichaems, en derselver verclaringe. Amsterdam, C. Danckertz, 1647. [VI.D.-46]

7. *The China-root Epistle*

Epistola, rationem modumque propinandi radicis Chynae decocti . . . Basle, J. Oporinus, 1546. [VII.-1]

Andreae Vesalii, ad Joachimum Roelants, de radice Chinae, epistolae. Followed by: Andreae Vesalii, de modo propinandae Chinae, scriptum italicum. In: A. Luisinus, Aphrodisiacus, sive de lue venerea . . . Leyden, J. A. Langerak and J. H. Verbeek, 1728, cols. 585-598. [VII.-7]

Brief van Andreas Vesalius . . . behelzende de aanwending van het decoct van Chynawortel . . . Trans. by H. Pinkhof, with an introduction by E. C. van Leersum. In: Opuscula selecta Neerlandicorum de arte medica, Amsterdam, 1915, Vol. 3. [VII.-9]

8. *The "Consilia"*

Consilium Vesalii ad Petrum Forestum. Latin and Dutch, edited by M. A. van Andel. In: Opuscula selecta Neerlandicorum de arte medica, Amsterdam, 1935, Vol. 13, pp. 9-15. [VIII. D.-4]

HARVEY CUSHING. *A Bio-Bibliography of Andreas Vesalius.* New York: Schuman's, 1943. xxxviii + 229 pp. 90 illustrations. $15.00.

This book, which will be off the press when these lines appear, represents Harvey Cushing's posthumous contribution to the Vesalius celebration of 1943. It seems appropriate, therefore, to announce it to the readers of the present issue of the Bulletin, even if time is too short for the thorough review it should receive.

Harvey Cushing's interest in Vesaliana goes back to the turn of the century, when William Osler "inoculated [him] with his bibliophilic spirit" (p. XVI). There followed many years of collecting, years of which Cushing himself has given a delightful account in his "Apologia" heading the present volume. His endeavors resulted not only in a superb collection of works by and on Vesalius, but also stimulated him to publish a Vesalian bibliography. This bibliography, moreover, was "to place the published writings of Vesalius in proper relation to those episodes of his life of which there is contemporary record" (p. XVII). Thus Cushing set out to write a bio-bibliography, in which the analysis of the various editions of each Vesalian work was preceded by an essay picturing the background on which the work under discussion had originated.

Harvey Cushing did not live to finish the book himself. When he died, the introduction and the first five chapters (The Paraphrase of the Ninth Book of Rhazes, The 'Tabulae Sex' and Plagiaries, Guenther's 'Institutiones Anatomicae,' The Venesection Epistle, and Contributions to the 'Opera Galeni') were almost complete. The important chapters 6 and 7 (The 'Fabrica' and Its Sequelae, and The China-Root Epistle and the Aftermath of the 'Fabrica'), however, were partly drafted and the rest was untouched. It was the task of the editor, Dr. John F. Fulton, to have the book completed, as well as checked and revised. In this task he had as collaborators Dr. W. W. Francis, Dr. Edward C. Streeter, Dr. Arturo Castiglioni (who prepared chapters 8 and 9, on The Consilia and on Fallopius), Mrs. John P. Peters (who compiled chapter 10 containing the literature on Vesalius) and Dr. Cushing's secretary, Miss Madeline Stanton.

The bibliographical sections proper give detailed descriptions of every work from the first edition to the most recent reprint or translation. The title of each edition is given in full, and is followed by collation, summary of contents, commentatorial notes, a list of existing copies and description of the copy used. Particularly where the latter belonged to Dr. Cushing's collection, details about its acquisition are given, thus adding a personal touch which will interest the wide circle of Dr. Cushing's friends.

This bio-bibliography of Vesalius is a handsome volume with numerous well chosen and well reproduced illustrations. It will be indispensable to every Vesalius scholar. The bibliographer will, of course, have to consult it constantly, while those interested in the life and achievements of Vesalius will find ample material in the essays, and a valuable guide to the later literature. The charming style of the narrative sections, moreover, will make the book interesting to all its readers.

O. TEMKIN

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WARFIELD T. LONGCOPE

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